LOCATION HYDRAULIC STUDY

San Diego Freeway (I-405) Improvement Project
SR-73 to I-605

Orange and Los Angeles Counties

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1.0 INTRODUCTION

This Location Hydraulic Study was prepared in support of the I-405 Improvement Project as described below. There are several locations along the project with potential floodplain impacts from longitudinal or transverse encroachments by the project. The purpose of this report is to evaluate locations where the project may impact a floodplain and make preliminary recommendations for mitigation and further study.

1.1 Project Overview and Location

The Orange County Transportation Authority (OCTA), in cooperation with the California Department of Transportation (Caltrans), proposes to improve mainline freeway and interchanges on Interstate 405 (I-405) in Orange County for approximately 14 miles (mi) between State Route (SR) 73, Post Mile (PM) 10.3, and Interstate 605 (I-605), PM 24.1, to reduce congestion and improve lane continuity through the corridor. Three build alternatives and a No Build Alternative are being considered for this project. Alternative 1 proposes to add one general purpose (GP) lane in each direction of I-405 from Euclid Street to I-605. Alternative 2 proposes to add the GP lane included in Alternative 1 and a second GP lane northbound (NB) from Brookhurst Street to the SR-22/7th Street interchange and southbound (SB) from Seal Beach Boulevard to Brookhurst Street. Alternative 3 proposes to add the GP lane included in Alternative 1 and add an additional median lane in each direction from SR-73 to I-605 to operate together with the existing high-occupancy vehicle (HOV) lanes as express lanes. Alternatives 1 and 2 have been carried forward from the Project Study Report/Project Development Support (PSR/PDS), which was prepared for the project initiation phase of the project. Alternative 3 was introduced at the beginning of the Project Approval/Environmental Document (PA/ED) phase as an alternative with future potential public-private partnership and design-build authority. Figure 1 shows a project location map.

PROJECT LOCATION MAP

Figure 1

PARSONS

All of the build alternatives would include mainline geometric and interchange ramp improvements as described below:

- Additional auxiliary lanes that link upstream on-ramps with downstream off-ramps
- Standard left and right shoulders for interchange ramps
- Increased ramp storage capacity
- Additional through and turn lanes at ramp intersection with local streets
- Removal of HOV bypass lanes from on-ramps, subject to individual analysis of each on-ramp and approval by Caltrans and the Federal Highway Administration (FHWA)
- A new on-ramp from eastbound (EB) Ellis Avenue to SB I-405
- Reconfiguration of the Brookhurst Street interchange
- Braided ramps in both directions between Magnolia Street and Warner Avenue
- Reconfiguration of the Beach Boulevard interchange
- Reconfiguration of the existing NB off-ramp to EB Westminster Avenue.

The proposed improvements would require 8 new structures; 17 overcrossing structure replacements, including 1 pedestrian bridge; and 5 undercrossing structure widening/modifications, including 2 railroad overheads. Several flood control channels would need to be upgraded, including 1 box culvert replacement, 3 box culvert extensions, and 3 new box culverts. Alternative 3 would require one additional structure replacement (Fairview Street Overcrossing), one additional undercrossing structure widening (Harbor Boulevard) and construction of a new direct connector at the I-405/SR-73 interchange.

1.2 Setting

1.2.1 Land Uses

The I-405 Improvement Project proposes to widen the freeway through a heavily urbanized area. The urban area consists mainly of residential and commercial developments.

1.2.2 Climate

The climate of the project area is classified as Mediterranean, which is characterized by warm, dry summers and mild, wet winters. Coastal areas have a moderate climate with frequent fog in the summer. Most of the precipitation comes as rain during the winter months. The major

contributions to the climate are the Eastern Pacific High and the Mediterranean effects of the Pacific Ocean. The mean high winter temperature is 65 degrees Fahrenheit (°F), and the mean high summer temperature is 77 °F. Orange County experiences 328 days of sunshine per year and an average daytime temperature of 73 °F.

1.2.3 Flood Control Structures

There are several flood control structures along the project corridor. Channels flow along residential and commercial developments, parks, and golf courses. Flood control levees exist for the Santa Ana River (SAR), Fountain Valley Channel, and East Garden Grove Wintersburg Channel to protect the surrounding area from flooding.

Most, if not all, flood control channels are engineered channels. Improvements have been made over the years, and the Orange County Flood Control District (OCFCD) plans to improve several structures to provide additional flood protection.

1.3 Project Description

The proposed improvements are needed to address:

- Inadequate capacity for peak-period traffic demand in GP lanes, as well as HOV lanes
- Operational and geometric deficiencies on the I-405 mainline and interchanges
- Inadequate technology to detect traffic incidents and provide rapid response
- Future traffic forecast, which shows significant increase in travel demand along the I-405 corridor

The purpose of the proposed improvements is to:

- Add capacity and reduce congestion on the GP and HOV lanes
- Enhance interchange operations
- Increase mobility, maximize throughput, improve trip reliability, and optimize operations
- Implement strategies that ensure the earliest project delivery
- Enhance safety

Additional objectives were also established for the project as follows:

- Minimize right-of-way (ROW) acquisition
- Ensure financial viability
- Meet the commitments of the Renewed Measure M to add capacity to I-405
- Maintain or improve future traffic performance within the corridor
- Improve the corridor to ensure that the facility is maintained as an effective link in the National Strategic Highway Network

1.4 Description of Type of Traffic

1.4.1 General Description

I-405 Mainline

With the current configuration, there is insufficient capacity on I-405 to accommodate existing travel demands. Based on 2009 traffic volumes, traffic capacity analysis shows that sections of I-405 currently operate at unacceptable level of service (LOS) during one or both of the peak periods. The existing HOV lanes also experience congestion during the peak hours.

With the anticipated future growth in Orange County, delay is expected to increase on I-405. Under Existing Conditions, traveling the approximately 14 miles of the project corridor requires 15 to 37 minutes during the peak hours, depending upon the direction of travel and time of day. Under Future Without Project conditions, the peak hour travel time in the I-405 corridor is projected to increase to a range of 107 to 163 minutes. Under Existing conditions, average peak hour travel speed on the I-405 corridor ranges from 22 to 54 miles per hour (mph). Under Future Without Project conditions, average peak hour travel speed on the I-405 corridor is projected to decrease to a range of 5 to 8 mph. Improvements to the I-405 corridor are needed to accommodate projected future traffic.

Truck traffic on I-405 accounts for approximately 3 - 3.5 percent of mainline traffic volume.

Interchange Ramps

Interchange on- and off-ramps along the I-405 corridor also experience unacceptable LOSs during peak periods.

1.4.2 Emergency Access, Supply, and/or Evacuation

I-405 is a conduit for emergency supplies and evacuations. Elevations on the top of the roadway and bridge deck would have sufficient freeboard above the water surface; therefore, they would not be inundated during a 100-year event. Emergency access, evacuations, and the flow of emergency supplies should not be impeded by flood flows.

1.5 Project Alternatives

1.5.1 No Build Alternative

Except as discussed in the subsequent paragraph, the No Build Alternative would maintain the existing configuration of the I-405 corridor with no additional lanes or interchange improvements to be provided. The existing configuration would not accommodate the future traffic demand, and the nonstandard features would not be corrected. Congestion along the corridor would not be alleviated, and the situation would deteriorate with time. This alternative is inconsistent with the Caltrans goal of providing an efficient and effective interregional mobility system. Because there are no improvements anticipated within the project limits, there are no construction or ROW costs associated with this alternative.

The future configuration under the No Build Alternative would assume completion of the West County Connector (WCC) Project, which is currently under construction and anticipated to be completed by 2014. The WCC Project would add two HOV lanes in the median of I-405 between SR-22 and I-605, along with HOV direct connectors at the I-405/SR-22 and I-405/ I-605 interchanges. Nine structures would be constructed as part of the WCC Project including:

- Bolsa Chica Road OC (replace), 55-1102, PM 0.92
- S405-E22 Connector (replace), 55-1101F, PM 20.75
- 22-405 HOV Direct Connector (new), 55-1103E, PM 20.66
- Seal Beach Boulevard OC (replace), 55-1099, PM 22.64
- N405-W22 Connector Separation (replace), 55-1100G, PM 23.27
- 405-605 HOV Direct Connector (new), 55-1098E, PM 24.02
- E22-N405 Connector UC (Lengthen), 55-0415, PM R0.16
- E22-N405/405 Separation Structure (replace), 55-1096G, PM R0.39

- E22-N605/405 Separation (replace), 55-1097G, PM R0.39

1.5.2 Build Alternative 1: Add One General Purpose Lane in Each Direction

Alternative 1 proposes to add one GP lane in each direction of I-405 from Euclid Street to I-605.

Proposed Engineering Features

Proposed engineering features in Alternative 1 are summarized as follows:

- Mainline features include:
  - Addition of one GP lane in each direction.
  - New auxiliary lane on NB I-405 at the approach of the Euclid Street off-ramp.
  - New auxiliary lane on NB I-405 between Seal Beach Boulevard on-ramp and SR-22/ 7th Street off-ramp.
  - New auxiliary lane on SB I-405 between Euclid Street on-ramp to Harbor Boulevard off-ramp.
  - Removal of the SB auxiliary lane between Beach Boulevard on-ramp and Magnolia Street off-ramp.
- Interchange features include:
  - Reconstruction of most existing interchange ramps from Euclid Street to Seal Beach Boulevard.
  - Additional through and turn lanes at ramp intersections with local streets.
  - Removal of HOV bypass lanes from on-ramps.
  - A new on-ramp from EB Ellis Avenue to SB I-405.
  - Reconfiguration of the Brookhurst Street interchange.
  - New braided ramps on both directions of I-405 between Warner Avenue and Magnolia Street.
  - Reconfiguration of the Beach Boulevard interchange.
- Structural features include:
  - 6 new structures, 17 structure replacements, and 5 structure widenings/modifications.
  - 1 box culvert replacement, 3 box culvert extensions, and 3 new box culverts.
  - Construction of retaining walls where needed.

- Reconstruction of existing soundwalls that would be impacted by the project construction.
- Construction of new soundwalls.

1.5.3 Build Alternative 2: Add Two General Purpose Lanes in Each Direction

Alternative 2 proposes to add one GP lane on both directions of I-405 from Euclid Street to I-405 and a second GP lane NB from Brookhurst Street to the SR-22/7th Street interchange and SB from Seal Beach Boulevard to Brookhurst Street.

Proposed Engineering Features

Proposed engineering features in Alternative 2 are summarized as follows:

- Mainline features include:
  - Addition of two GP lanes in each direction.
  - New auxiliary lane on NB I-405 at the northerly approach of the Euclid Street off-ramp.
  - New auxiliary lane on NB I-405 between Euclid Street on-ramp and Brookhurst Street off-ramp.
  - New auxiliary lane on SB I-405 between Euclid Street on-ramp to Harbor Boulevard off-ramp.
  - Removal of the SB auxiliary lane between Beach Boulevard on-ramp and Magnolia Street off-ramp.
- Interchange features include:
  - Reconstruction of most existing interchange ramps from Euclid Street to Seal Beach Boulevard.
  - Additional through and turn lanes at ramp intersections with local streets.
  - Removal of HOV bypass lanes from on-ramps.
  - A new on-ramp from EB Ellis Avenue to SB I-405.
  - Reconfiguration of the Brookhurst Street interchange.
  - New braided ramps on both directions of I-405 between Warner Avenue and Magnolia Street.
  - Reconfiguration of the Beach Boulevard interchange.
- Structural features include:

- 6 new structures, 17 structure replacements, and 5 structure widenings/modifications.
- 1 box culvert replacement, 3 box culvert extensions, and 3 new box culverts.
- Construction of retaining walls where needed.
- Reconstruction of existing soundwalls that would be impacted by the project construction.

  Construction of new soundwalls.

1.5.4 Build Alternative 3: Add One General Purpose Lane Plus Express Lane in Each Direction

Alternative 3 is the only alternative being considered with a toll component that may utilize future potential public-private partnership and design-build authority to construct. Alternative 3 would add one GP lane in each direction along I-405 from Euclid Street to I-605 and would provide an Express Facility with 4 lanes (2 in each direction) for approximately 15 miles on I-405 from SR-73 to I-605. The Express Facility would include the existing HOV lanes (1 lane in each direction from SR-73 to SR-22 East and 2 lanes in each direction between SR-22 East and I-605), as well as a new lane in each direction from SR-73 to SR-22 East.

Proposed Engineering Features

Proposed engineering features in Alternative 3 are summarized as follows:

- Mainline features include:
  - Addition of one GP lane in each direction.
  - Provision of tolled express lanes combined with HOV usage.
  - New auxiliary lane on NB I-405 at the northerly approach of the Euclid Street off-ramp.
  - New auxiliary lane on NB I-405 between Seal Beach Boulevard on-ramp and SR-22/7th Street off-ramp.
  - New auxiliary lane on SB I-405 between Euclid Street on-ramp to Harbor Boulevard off-ramp.
  - Removal of the SB auxiliary lane between Beach Boulevard on-ramp and Magnolia Street off-ramp.
- Interchange features include:
  - Reconstruction of most existing interchange ramps from Fairview Road to Seal Beach

Boulevard.

- Additional through and turn lanes at ramp intersections with local streets.
- Removal of HOV bypass lanes from on-ramps.
- Partial reconstruction of the NB branch connector and the I-405/Fairview Road collector-distributor system.
- A new on-ramp from EB Ellis Avenue to SB I-405.
- Reconfiguration of the Brookhurst Street interchange.
- New braided ramps on both directions of I-405 between Warner Avenue and Magnolia Street.
- Reconfiguration of the Beach Boulevard interchange.

- Structural features include:
  - 7 new structures, 18 structure replacements, and 6 structure widenings/modifications.
  - A new direct connector in the median between I-405 and SR-73.
  - 1 box culvert replacement, 3 box culvert extensions, and 3 new box culverts.
  - Construction of retaining walls where needed.
  - Reconstruction of existing soundwalls that would be impacted by the project construction.

Construction of new soundwalls.

1.6 Floodplain Description

Floodplain and Floodway

Floodplains are areas of land inundated by the river during the 100-year flood. Floodplains are a natural feature of rivers that may also occur in portions of a watershed on land depressions or wetlands. They are the mostly flat land adjacent to the river and are formed due to the actions of a river. Designated Floodway refers to the channel of the stream and that portion of the adjoining floodplain reasonably required to provide for the passage of a design flood. Developments are prohibited in the floodway. Figure 2 depicts both floodplain and floodway areas.

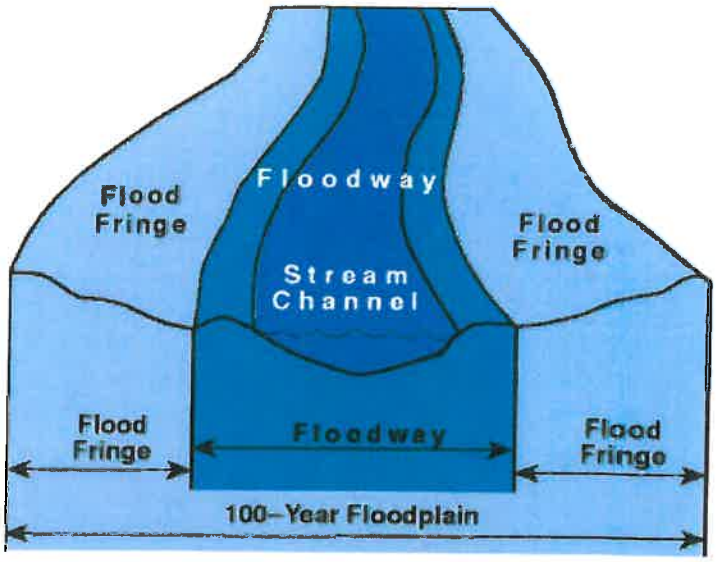


Figure 2 – Typical Floodplain and Floodway Location with Respect to the Main Stream

Rivers erode their own banks and redeposit the eroded material downstream. Material is added to the floodplain during floods, a process called overbank deposition. Rivers are constantly trying to reach an equilibrium state where there is balance of water and soil material. The material that underlies floodplains is a mixture of thick layers of sand and thin layers of mud. Undisturbed floodplains provide natural buffer by: (a) reducing the number and severity of floods, (b) minimizing non-point source water pollution, (c) filtering stormwater, (d) providing habitat for plants and animals, and (e) creating aesthetic beauty and outdoor recreation benefits.

When the flow in the river overtops its banks, the overflow spreads over the floodplain, which slows the flow of the water. Reduced water velocity can help prevent severe erosion and flooding downstream. In addition, during high water events, some of the water is absorbed by the floodplain, reducing the extent of the flooding. The absorbed water can then be returned to the stream during times of low water.

Floodplains are also home to many types of plants and animals and may also have forests and wetlands on or adjacent to them. These river edges provide habitat for insects, birds, reptiles, amphibians, and mammals. The vegetation also helps filter contaminants out of the water flowing into the river. In addition, vegetated floodplains provide shade for the adjacent rivers

and streams, increasing dissolved oxygen levels and consequently improving habitat for aquatic plants and animals.

In general, a floodplain cannot be altered in any way until it has been shown that alteration will pass the base flood without significant damage to either the floodplain or surrounding areas. No bridge abutment or embankment shall encroach on a regulatory floodway.

FEMA Designations

The Federal Emergency Management Agency (FEMA) designates Special Flood Hazard Areas (SFHAs) according to Zones. The Base Flood Elevation (BFE) is the water-surface elevation of the 1 percent annual chance of flood. The zones are described as:

Zone A – Corresponds to the 100-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. No BFEs or depths have been determined.

Zone AE – Corresponds to the areas of 100-year floodplains that are determined in the FIS by detailed methods. In most instances, BFEs have been derived from detailed hydraulic analyses and are shown within this zone.

Zone AH – Corresponds to the areas of 100-year shallow flooding with a constant water-surface elevation. Flood depths are 1 to 3 feet (usually areas of ponding); BFEs are derived from detailed hydraulic analyses and are shown at selected intervals within this zone.

Zone AO – Corresponds to the areas of 100-year shallow flooding. Flood depths are 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities are also determined.

Zone AR – Depicts areas protected from flood hazards by flood control structures such as levees that are being restored.

Zone X (dotted) – Other flood areas. Areas of 0.2 percent annual chance flood; areas of 1 percent annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1 percent annual chance flood.

Zone X – Areas determined to be outside the 0.2 percent annual chance floodplain.

Flood hazard areas within the study corridor are shown in Appendix A.

1.7 Federal Regulations

National Flood Insurance Program

FEMA developed the National Flood Insurance Program (NFIP) to assist thousands of communities across the country with floodplain management. NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these participating communities. In addition to providing flood insurance and reducing flood damage through floodplain management regulations, the NFIP identifies and maps the nation's floodplains. Mapping flood hazards creates broad-based awareness of the flood hazards and provides the data needed for floodplain management programs and to actuarially rate new construction for flood insurance.

Executive Order (EO) 11988 directs all federal agencies to avoid to the extent practicable and feasible all short-term and long-term adverse impacts associated with floodplain modification and to avoid direct and indirect support of development within 100-year floodplains whenever there is a reasonable alternative available. Projects that encroach upon 100-year floodplains must be supported with additional specific information. The U.S. Department of Transportation Order 5650.2, Floodplain Management and Protection, prescribes "policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts in agency actions, planning programs, and budget requests." The order does not apply to areas with Zone C (areas of minimal flooding as shown on FEMA Flood Insurance Rate Maps [FIRM]).

U.S. Environmental Protection Agency

Under the Clean Water Act (CWA), the United States Environmental Protection Agency (EPA) was granted authority to implement pollution control programs, such as setting wastewater standards for industry. The CWA established the basic structure for regulating discharges of pollutants into the waters of the United States; in addition, it contains requirements to set water quality standards for all contaminants in surface waters. The CWA created the National Pollutant Discharge Elimination System (NPDES) permit program to regulate the discharge of

any pollutant from a point source into navigable waters by requiring those point sources to obtain a permit if their discharges go directly to surface waters.

Federal Emergency Management Agency

A Floodplain Evaluation is required as described under the NFIP (23 *Code of Federal Regulations* [CFR] 650, Subpart A Section 650). Section 650.111 of the regulations calls for location hydraulic studies to be performed with detailed engineering design drawings. Hydraulic modeling will be required, along with a hydraulic report summarizing the results (to be submitted for review by the local agencies listed in the FIRMs). A Conditional Letter of Map Revision (CLOMR) and a Letter of Map Revision (LOMR) may be required by FEMA for work within a floodway or for work resulting in significant impacts to the 100-year floodplain.

Clean Water Act (33 U.S.C. § 1251 *et seq.*)

The purpose of the CWA is restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters through prevention and elimination of pollution. The CWA applies to discharges of pollutants into waters of the United States. California's State Water Resources Control Board (SWRCB) is the State agency with primary responsibility for implementation of State and federally established regulations relating to hydrology and water quality issues. Typically, all regulatory requirements are implemented by the SWRCB through the nine different Regional Water Quality Control Boards (RWQCBs) established throughout the state. The CWA operates on the principle that any discharge of pollutants into the nation's waters is prohibited unless specifically authorized by a permit; permit review is the CWA's primary regulatory tool.

1.8 Required Permits and Approvals

The following permits may be required for water bodies impacted by the project.

Section 404 Permits

CWA Section 404 establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Responsibility for administering and enforcing Section 404 is shared by the U.S. Army Corps of Engineers (USACE) and EPA. USACE administers the day-to-day program, including individual permit decisions and

jurisdictional determinations; develops policy and guidance; and enforces Section 404 provisions.

Section 401 Certification: Certification by the RWQCB to USACE and U.S. Fish and Wildlife Service

Certifies that Section 404 mitigation plan conforms to applicable Section 401 water quality standards from Santa Ana River RWQCB under Region #8 Federal CWA (Section 401).

NPDES Permit

Documents that completed project meets applicable water quality standards for drainage and runoff. An NPDES permit and Storm Water Pollution Prevention Plan (SWPPP)) are required from SWRCB under the Federal CWA (Section 402).

NPDES Permitting Requirements for Dewatering Discharges (Permit R8-2006-0004)

Discharges consisting solely of stormwater or minor discharges of non-stormwater containing sediment as the only pollutant are allowed to be discharged under the NPDES Statewide Permit. Examples of the latter are groundwater, water from cofferdams, and water diversions. The definition of a minor discharge in Region 8 is less than 0.25 million gallons per day (mgd) and 4 months' duration. A major discharge of non-stormwater, or stormwater or non-stormwater discharges containing pollutants other than sediment, require a site-specific dewatering permit from the RWQCB. (RWQCB, Region #8 Federal CWA [Section 402])

"Section 1602" Streambed Alteration Agreement; "Section 2080"

Agreement for threatened and endangered species from California Department of Fish and Game California Public Resources Code.

2.0 FLOODPLAIN DETERMINATION

Flood hazard areas were determined based upon the FEMA FIRM, found in Appendix A, and the FIS. Field visits in May 2010 were conducted to evaluate potential causes of flooding, flood zone properties, and accuracy of the FEMA maps. Photos are shown in Appendix B. Other sources, such as topographic mapping and aerial photos, were utilized in determining the degree of flooding, drainage tributary areas, and potential flooding risk. The updated Orange County FIS and FIRM are dated December 3, 2009. The FIS contains this notice:

> *NOTICE TO FLOOD INSURANCE STUDY USERS*
> *Communities participating in the National Flood Insurance Program has established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data. Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.*

As advised by FEMA, the OCFCD was consulted for accuracy of the FIRM maps, specifically Zone A designations (No BFE or depths determined). OCFCD staff have indicated that some FEMA floodplain delineations are not accurate. OCFCD has provided additional studies for waterways not conforming to the most recent FEMA FIRM maps. These are discussed in Section 3.1 for each waterway.

According to the Caltrans Standard Environmental Reference (SER), if there is no state or federal floodplain data available, the local agency or Caltrans is responsible for examining other data regarding recent flood locations and developing adequate information and analysis to support the conclusions presented in the technical report.

It is anticipated that there will be some floodplain encroachment throughout the corridor. Encroachment will vary at the each location depending on the proposed roadway improvement.

2.1 Extent of Floodplain Encroachment

In accordance with FEMA FIRMs, the following water bodies have been designated flood hazard areas. A composite floodplain map and FEMA maps are located in Appendix A and display areas with higher flood hazard, such as Zones A and AE.

Although detailed designs of I-405 flood control crossings have not been developed, the affected channels are expected to have minimal floodplain encroachments. Hydraulic modeling evaluating the effects of the proposed improvement areas (along with potential flood mitigation where necessary) would be required during the final design phase. Pursuant to State regulation, the bridges would be designed to have sufficient freeboard above the 100-year flood water surface elevations; therefore, the bridge deck would not impact flood flows.

The following identifies Flood Hazard Areas along the project corridor: The extent of floodplain encroachment will be discussed in their respective sections.

1. Delhi Storm Drain

The Delhi Storm Drain, also known as the Santa Ana Garden Channel, is shown on FIRM Map #06059C0267J and #06059C0259, December 3, 2009. The channel is designated as Zone A, and 100-year flood discharge is contained in the channel.

The I-405 Improvement Project would not impact the Delhi Storm Drain floodplain.

2. Greenville-Banning Channel D03

The Greenville-Banning Channel is shown on FIRM Map #06059C0258J, December 3, 2009. The channel is designated as Zone A, and 100-year flood discharge is contained in the channel.

Alternatives 1 and 2 would not impact the Greenville-Banning Channel. Alternative 3 would require extension of the existing triple 12-foot by 12-foot reinforced concrete box (RCB) crossing at the upstream end to accommodate the proposed widen roadway. Work would also include reconstruction of headwall and wingwall, and channel work.

According to the preliminary hydraulics analysis (Preliminary Bridge Hydraulics Report for Greenville-Banning Channel, Parsons, June 2010), the proposed action would have a

negligible amount of increase in water surface elevation and velocity. The culvert extension would not alter the existing floodplain.

3. Gisler Storm Channel

The Gisler Storm Channel is shown on FIRM Maps #06059C0258J and #C06059C0259J, December 3, 2009. The channel is designated Zone A, and 100-year flood discharge is contained in the channel.

Alternatives 1 and 2 would not impact the Gisler Storm Channel. Alternative 3 would have some roadway improvements that may impact the channel; however, the channel would be restored to its original state.

4. Santa Ana River

The SAR is shown on FIRM Map #06059C0258J, December 3, 2009. The SAR is designated as Zone A, and 100-year flood discharge is contained in the channel. The map also shows levee systems on both sides of the channel.

The adjacent lands are designated as Zone X (dotted). See FIRM maps regarding notes on levee system.

All of the build alternatives would have the same impact on the SAR. The proposed improvement is to widen the existing I-405 bridge over the river and add a new Euclid Street SB on-ramp bridge. Proposed improvements are shown in Appendix B.

According to the preliminary hydraulics analysis (Preliminary Bridge Hydraulics Report for Santa Ana River, Parsons, December 2009), the proposed improvements would cause a slight increase in water surface and velocities; however, normal depths would be reached shortly downstream on the proposed Euclid Street on-ramp bridge.

The 100-year floodplain would still be contained in the channel.

5. Fountain Valley Channel (D06)

The Fountain Valley Channel is shown on FIRM Map #06059C0254J, December 3, 2009. The channel is levied immediately upstream of I-405 and downstream, outside of Caltrans ROW. The channel is designated Zone A.

6. Ocean View Channel (C06)

The Ocean View Channel is shown on FIRM Maps #06059C0253J and #06059C0254J, December 3, 2009. The channel and adjacent lands are designated as Zone A north of I-405. The floodplain comingles with the East Garden Grove-Wintersburg Channel (EGGWC). The 100-year flows are contained in the channel downstream of the I-405.

7. East Garden Grove-Wintersburg Channel (C05)

The EGGWC is shown on FIRM Map #06059C0251J, December 3, 2009. The channel is levied downstream and upstream of I-405. The channel is designated as Zone A north and south of I-405, and it covers a considerably large area, including the Edinger Channel, Newland Channel, and Ocean View Channel. Residential areas are shown to be inundated by the 100-year storm.

According to the hydrology report for the EGGWC (Facility No. C05) Bolsa Chica Bay to Vermont Avenue, dated July 1990 by Environmental Management Agency, nearly the entire length of the EGGWC is deficient.

The I-405 Improvement Project proposes to widen the roadway over the channel. Bridges over the channel are proposed to minimize impacts to the channel. At the upstream end, it is proposed to construct a center pier hidden behind a retaining wall structure so that no bridge components would encroach on the channel. At the downstream end, it is proposed to construct a pier wall in line with the existing RCB walls.

OCFCD is currently studying the EGGWC at a regional scale. Several proposed structures, such as retention basins and channel widenings, are being considered to protect the area from potential flooding. Because the EGGWC system is very complex at the I-405 crossing, a physical model was constructed to depict actual field conditions. The physical model was completed in September 2010. OCFCD will use this information to develop a hydraulic model for EGGWC and its tributaries. Coordination with OCFCD for future phases of design shall be maintained to analyze the addition of piers.

8. Newland Storm Channel

The Newland Storm Channel is shown on FIRM Map #06059C0251J, December 3, 2009. The channel is designated as Zone A adjacent to I-405. According to OCFCD, the Newland Storm Channel is deficient. OCFCD is currently studying the channel and has plans for future improvements.

The I-405 Improvement Project would not impact the Newland Storm Channel.

9. Edinger Storm Channel (C05S05)

The Edinger Storm Channel is shown on FIRM Map #06059C0251J, December 3, 2009. The channel is designated as Zone A adjacent to I-405. The Edinger Storm Channel is currently in construction and will provide a 100-year level of protection. A new rectangular channel parallel to I-405 will be built, along with a new reinforced concrete pipe (RCP) under the freeway. Refer to the Edinger Improvement Plans, OCFCD 2009.

The I-405 Improvement Project would not impact the Edinger Storm Channel floodplain.

10. Westminster Channel (C04)

The Westminster Channel is shown on FIRM Map #060J9C0232J, December 3, 2009. The channel is designated as Zone A with some overtopping. The adjacent lands are designated as Zone X (dotted).

The I-405 Improvement Project would not impact the Westminster Channel floodplain.

11. Anaheim-Barber City Channel (C03)

The Anaheim-Barber City Channel is shown on FIRM Map #06059C0119J, December 3, 2009. The channel is designated as Zone A, and the 100-year flood discharge is contained in the channel.

The I-405 Improvement Project would not impact the Anaheim-Barber City Channel

12. Bolsa Chica Channel (C02)

The Bolsa Chica Channel is shown on FIRM Map #06059C0118J, December 3, 2009. The channel is designated as Zone A, and 100-year flows are contained in the channel. There is a

gap downstream of I-405 that is designated Zone D. East of the channel, the area adjacent to I-405 is designated as Zone X (dotted).

The I-405 Improvement Project would not impact the floodplain for the Bolsa Chica Channel.

13. Federal Storm Channel

The Federal Storm Channel is shown on FIRM Map #06059C0114J, December 3, 2009. The earthen channel downstream is designated as Zone D. The Old Ranch Golf Course Retarding Basin to the north is designated as Zone AE and outlets to the Federal Storm Channel. Flows from the retarding basin are metered out by a culvert under the freeway and outlets into an open earthen channel.

The I-405 Improvement Project would not impact the Federal Storm Channel floodplain.

14. Bixby Storm Channel (OCFCD Facility No. C01P04)

The Bixby Storm Channel is shown on FIRM Map #06059C0114J, December 3, 2009. The channel is designated as Zone A. The map shows that the 100-year flood discharge is contained in the trapezoidal concrete channel. The adjacent lands are designated as Zone X (dotted), protected by levees from 1 percent annual chance flood. Although there are no BFEs shown on the FEMA map, a recent hydrology study, Bixby Channel Diversion Drainage Study for the WCC Project (AECOM, August 2009), indicates that the 100-year flows overtop the existing channel. No floodplain delineations were modeled.

The WCC Project proposes to widen Bixby Channel because it will redirect approximately 15.8 acres to the Bixby Channel watershed. The existing trapezoidal channel will be reconstructed as a rectangular channel. The post-project condition 100-year discharge will still overtop the channel because the outlet at the Montecito Storm Channel controls the hydraulic system. In an agreement with OCFCD and OCTA, a new bypass channel for Bixby Channel would be constructed as part of the I-405 Improvement Project that would capture the 100-year discharge and alleviate additional flow on the Montecito Storm Channel.

15. Montecito Storm Channel (OCFCD Facility No. C01S03)

The Montecito Storm Channel is shown on FIRM Map #06059C0114J, December 3, 2009. The channel is designated as Zone A. The map indicates that the 100-year flood discharge is contained in the channel.

3.0 RISK AND IMPACTS

Review of NFIP, field investigation, topographic mapping, and tributary drainage indicates that the proposed freeway widening would have very small to no significant risks to life and properties.

4.0 NATURAL AND BENEFICIAL FLOODPLAIN VALUES

According to the Santa Ana RWQCB's Basin Plan, the SAR is the only flood control facility that has natural and beneficial floodplain values.

The SAR outlets to the Pacific Ocean between Newport Beach and Huntington Beach. The Santa Ana RWQCB designates beneficial uses for waters in the SAR Watershed, which are identified in the Basin Plan (RWQCB 1995). The beneficial uses that have been identified for Reaches 1 and 2 of the SAR are as follows:

- Municipal and Domestic Supply – Waters are used for community, military, municipal, or individual water supply systems. These uses may include, but are not limited to, drinking water supply.
- Wildlife Habitat – Uses of water that supports terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
- Warm Freshwater Habitat – Maintenance of warm water ecosystems.
- Body Contact Recreation – Recreational activities involving body contact with water.
- Non-Body Contact Recreation – Recreational activities involving proximity to water, but generally no body contact or ingestion of water.

5.0 PROBABLE INCOMPATIBLE FLOODPLAIN DEVELOPMENT

It is determined that floodplain encroachments would not adversely affect the BFEs.

Every effort will be made so that the project remains compatible with the NFIP of FEMA.

6.0 MEASURES TO MINIMIZE IMPACTS

The following measures will be incorporated into the design and construction phases to minimize potential floodplain impact:

- Provide positive drainage during construction and refrain from diverting flows.
- Employ recommended Best Management Practices (BMPs)
- In-river construction and post construction shall include erosion control and water quality protection.
- A contingency plan shall be developed for unforeseen discovery of underground contaminants.
- Construction activities between October and May shall be limited to those actions that can adequately withstand high flows and entrainment of construction materials.
- Adequate conveyance capacity will be provided at bridge crossings to ensure no net increase in velocity.

7.0 PRACTICABILITY OF ALTERNATIVES

Because the proposed work is located in an existing highway, a new highway location alternative cannot be evaluated. The proposed work would widen the existing freeway to accommodate HOV lanes. The only variable to the impacts is the degree of encroachment. Disturbance to the floodplains shall be minimized as much as possible.

The proposed action conforms to applicable State or local floodplain protection standards.

8.0 FUTURE CONSIDERATION

Per FHWA Sec 650.115 Design Standards Guidelines, design of highways:

1. The design selected for an encroachment shall be supported by analyses of design alternatives with consideration give to capital cost and risk, risk analysis or assessment

2. The design flood for encroachments by through lanes of Interstate highways shall not be less than the flow with a 2 percent chance of being exceeded in any given year. No minimum design flood is specified for Interstate highway ramps and frontage roads or for other highways

3. Freeboard shall be provided, where practicable, to protect bridge structures from debris- and scour-related failure.

9.0 EVALUATION CRITERIA

A summary of the evaluation criteria is provided in Table 1. This table indicates that the I-405 Improvement Project would have no material effect on natural and beneficial floodplain values or incompatible floodplain development, and it would not create a high-risk condition.

Channel Name	Q_{100} year (cfs)**	Type of Encroach-ment	Effects on Natural Beneficial Values	Effects on Incompatible Development	High Risk		
					Alt. 1	Alt. 2	Alt. 3
Delhi Storm Drain	Unknown+	Transverse	None	None	N/A	N/A	N/A
Gisler Storm Channel*	Unknown+	Transverse	None	None	N/A	N/A	No
Mesa Verde Storm Drain	Unknown+	Transverse	None	None	N/A	N/A	N/A
Greenville-Banning Channel (D03)	3,450	Transverse	None	None	N/A	N/A	No
Hyland Avenue Storm Drain	370	Transverse	None	None	N/A	N/A	N/A
Santa Ana River	47,000	Transverse	None	None	Moderate		
Fountain Valley Channel (D06)	172	Transverse	None	None	No	No	No
Ocean View Channel (C06)	1,930	Transverse	None	None	No	No	No
East Garden Grove-Wintersburg Channel (C05)	5,910	Transverse	None	None	No	No	No
Newland Storm Channel	1,080++	Transverse	None	None	No	No	No
Edinger Storm Channel* (C05S05)	Unknown+	Longitudinal	None	None	No	No	No
Westminster Channel* (C04)	4,190	Transverse	None	None	No	No	No

Channel Name	Q_{100} year (cfs)**	Type of Encroach-ment	Effects on Natural Beneficial Values	Effects on Incompatible Development	High Risk		
					Alt. 1	Alt. 2	Alt. 3
Anaheim-Barber City Channel (C03)	7,450	Transverse	None	None	N/A	N/A	N/A
Milan Storm Drain	Unknown+	Transverse	None	None	No	No	No
Bolsa Chica Channel (C02)	4,100	Transverse	None	None	N/A	N/A	N/A
Federal Storm Channel	332	Transverse	None	None	No	No	No
Bixby Storm Channel*	203	Longitudinal	None	None	No	No	No
Montecito Storm Channel	410	Transverse	None	None	No	No	No

* Runs parallel to I-405 freeway
**Source of information is from OCFCD Hydrology Reports
+ No data available
++1,080 cubic feet per second (cfs) Estimated Peak 100-year flow and 550 cfs Channel Capacity
RCB – reinforced concrete box; RCP – reinforced concrete pipe
N/A – No floodplain Impacts.

10.0 REFERENCES

1. Flood Insurance Rate Maps, Various, by the Federal Emergency Management Agency.

2. Montecito Channel Hydrology Report No C01-3.

3. Bixby Channel Hydrology Report No C01-S04.

4. Hydrology Report for Los Alamitos Channel.

5. Hydrology Report No. C02-4A, Bolsa Chica Channel (C02) San Diego Freeway to Cerritos Avenue, dated January 1997, by Orange County Public Facilities and Resources Department.

6. Hydrology Report No. C03-4, Anaheim-Barber City Channel Facility No. C03 Entire Drainage System, dated September 1986, by Orange County Resources and Development Management Department.

7. Hydrology Report No.C04-4, Westminster Channel (Facility No. c04) Entire Drainage System Hydrology, dated December 2002, by Orange County Public Facilities and Resources Department.

8. Hydrology Report – Newland Storm Channel Facility No. C05S01, dated August 2005, by Orange County Resources and Development Management Department.

9. Hydrology Report for East Garden Grove-Wintersburg Channel (Facility No. C05) Bolsa Chica Bay to Vermont Avenue, dated July 1990, by Environmental Management Agency.

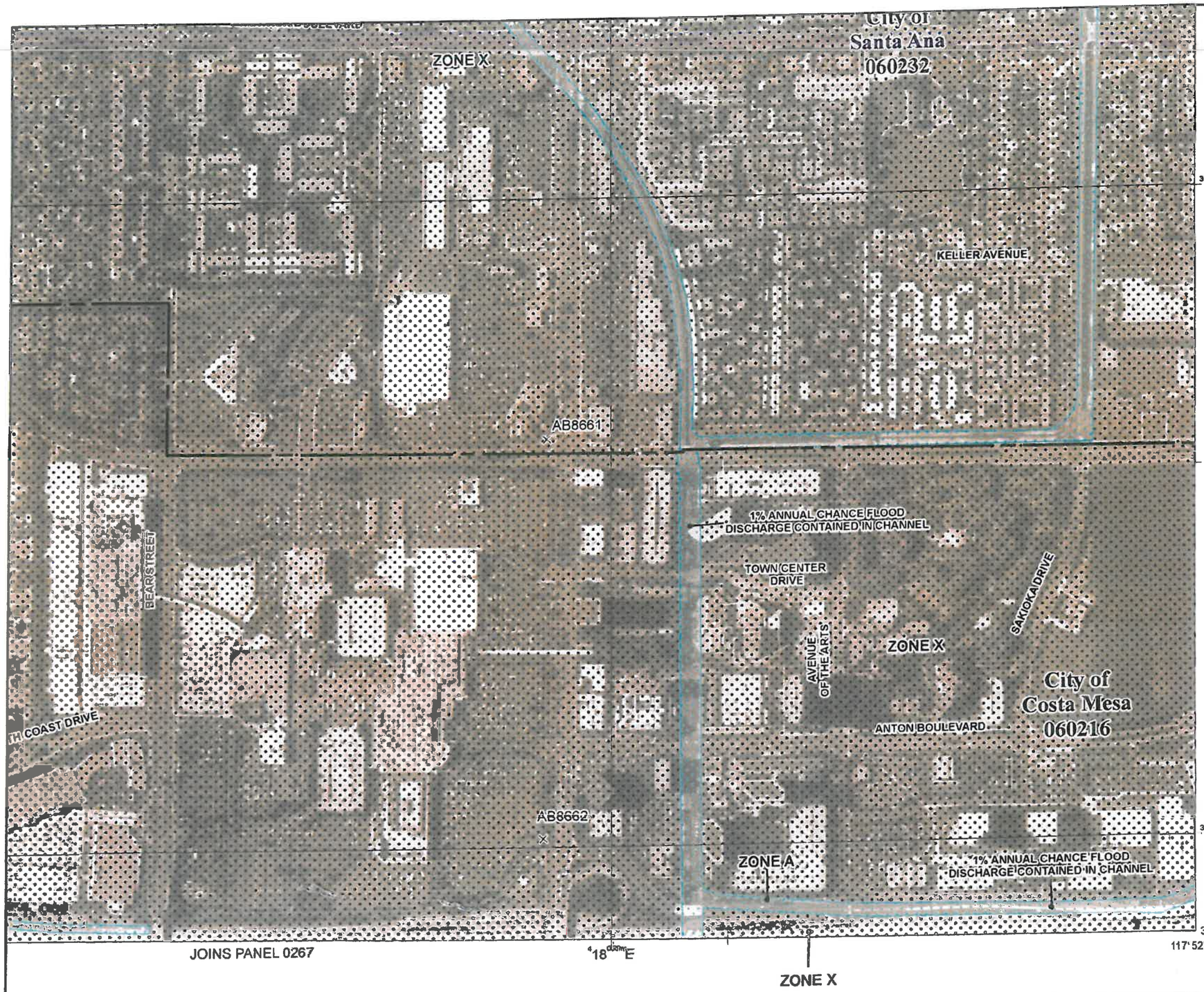
10. Hydrology Report No. C06-2, Ocean View Channel, Facility No, C06, Entire Drainage System, dated November 1989, by Environmental Management Agency.

11. The 100-year discharge is 47,000 cfs per "US Army Corps of Engineers, Design Flood Peak Dischargers, SAR, Future Conditions, "Santa Ana River Mainstem Phase II General Design."

12. Hydrology Report No. D03-4, Greenville-Banning Channel (Facility No. D03), dated June 1999, by Orange County Environmental Management Agency.

APPENDIX A

FEMA FIRM MAPS



ional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000

FEET

METERS

PANEL 0259J

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 259 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COSTA MESA, CITY OF	060216	0259	J
SANTA ANA, CITY OF	060232	0259	J

Notice to User. The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

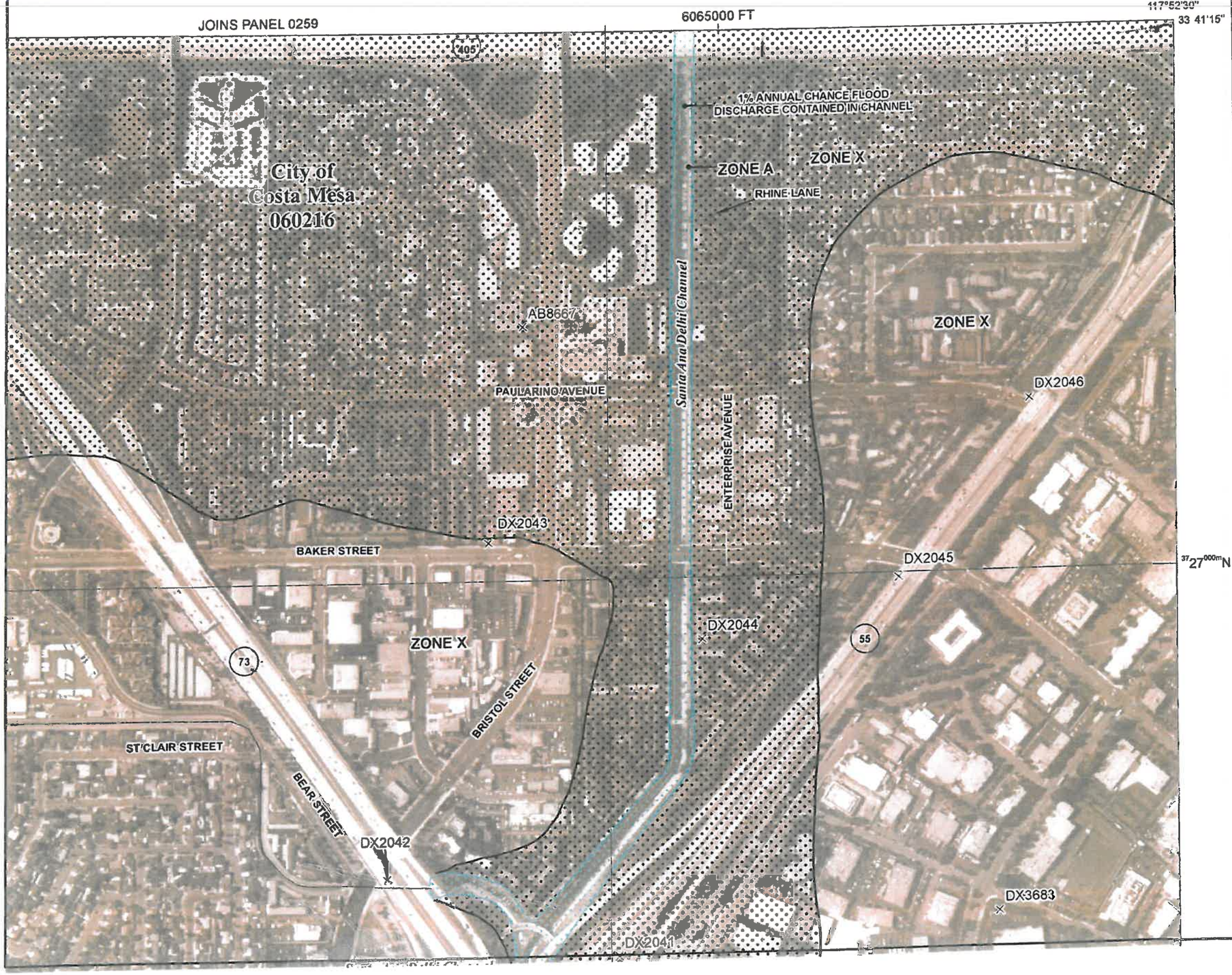
MAP NUMBER
06059C0259J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

DELHI CHANNEL

1 OF 2



tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0267J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 267 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COSTA MESA, CITY OF	060216	0267	J
NEWPORT BEACH, CITY OF	060220	0267	J
ORANGE COUNTY	060212	0267	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06059C0267J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

DELHI CHANNEL

2 OF 2

tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS

Santa Ana
060232

City of
Costa Mesa
060216

WEST SUNFLOWER AVENUE

PACIFIC ELECTRIC RAILROAD

HYLAND AVENUE

$^{37}29^{000m}N$

ZONE X

ZONE A

SOUTH COAST DRIVE

reenville Banning Channel

ANNUAL CHANCE FLOOD
RGE CONTAINED IN CHANNEL

City of
Costa Mesa
060216

ZONE A

ZONE A

ZONE X

Note: This area is shown as being protected from the 1-percent-annual-chance or greater flood hazard by a levee system. Overtopping or failure of any levee system is possible. For additional information, see the "Accredited Levee Note" in Notes to Users.

EX

405

1% ANNUAL-CHANCE FLOOD DISCHARGE CONTAINED IN CHANNEL

$^{37}28^{000m}N$

33°41'15"

117°54'22.5"

$^{415}000mE$

$^{416}000mE$

JOINS PANEL 0266

PANEL 0258J

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 258 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COSTA MESA, CITY OF	060216	0258	J
FOUNTAIN VALLEY, CITY OF	060216	0258	J
SANTA ANA, CITY OF	060232	0258	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06059C0258J

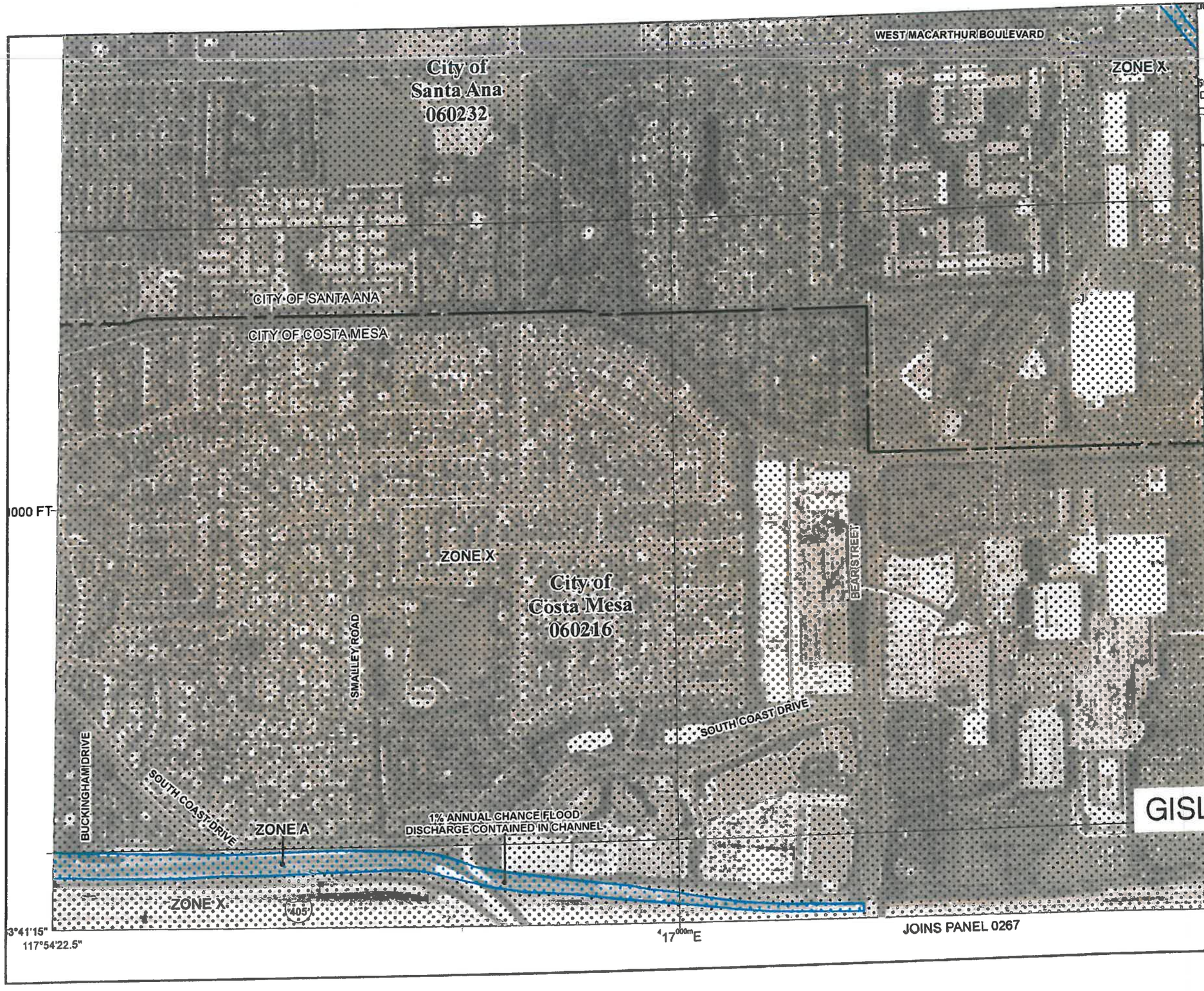
MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

GISLER STORM CHANNEL

1 OF 2

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



ional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0259J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 259 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COSTA MESA, CITY OF	[illegible] 060216	[illegible] 0259	J
SANTA ANA, CITY OF			J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06059C0259J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

GISLER STORM CHANNEL

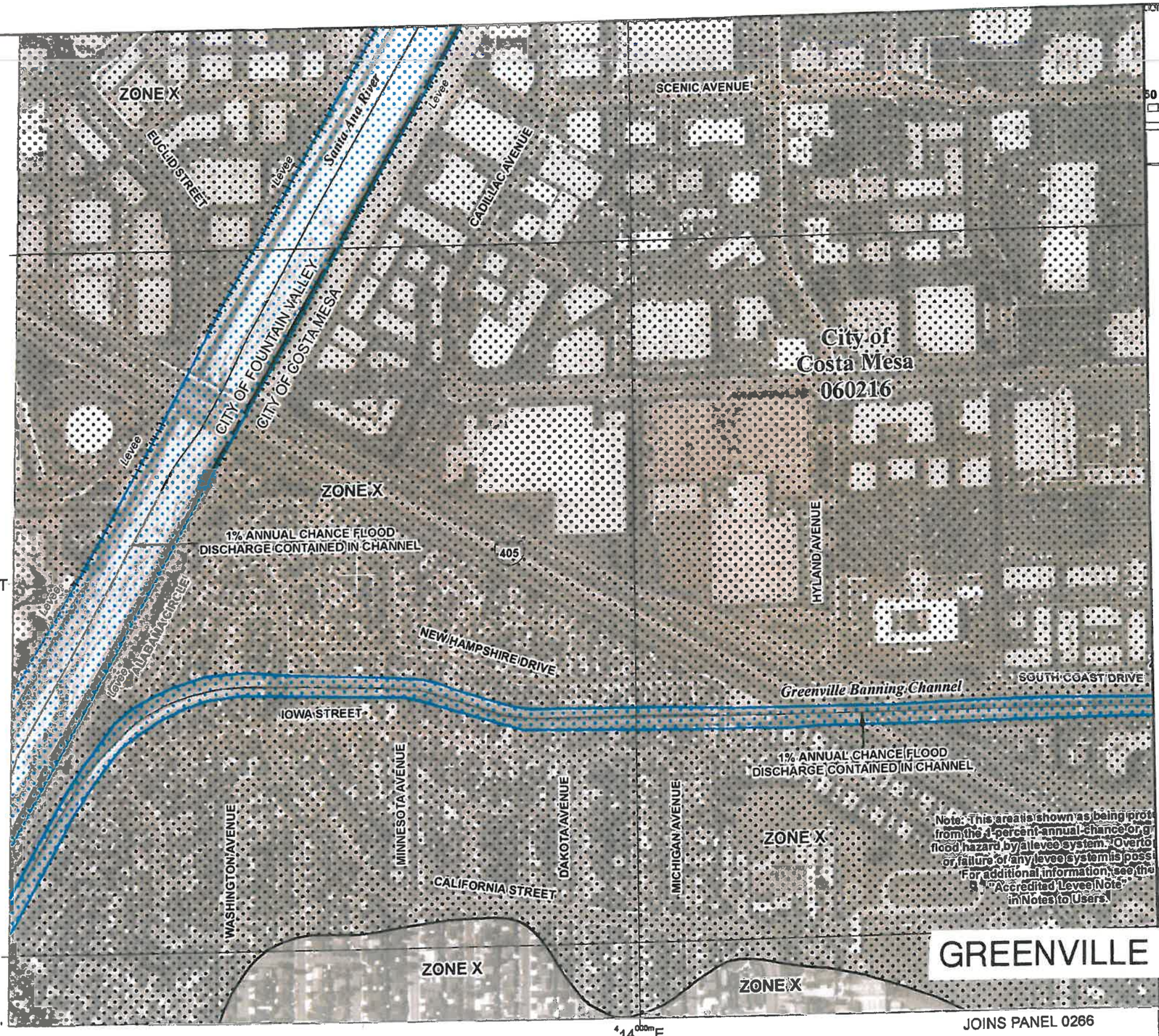
2 OF 2

ional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS



PANEL 0268J

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 258 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
COSTA MESA, CITY OF	060216	0258	J
FOUNTAIN VALLEY, CITY OF	060219	0258	J
SANTA ANA, CITY OF	060212	0258	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community

MAP NUMBER
06059C0258J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

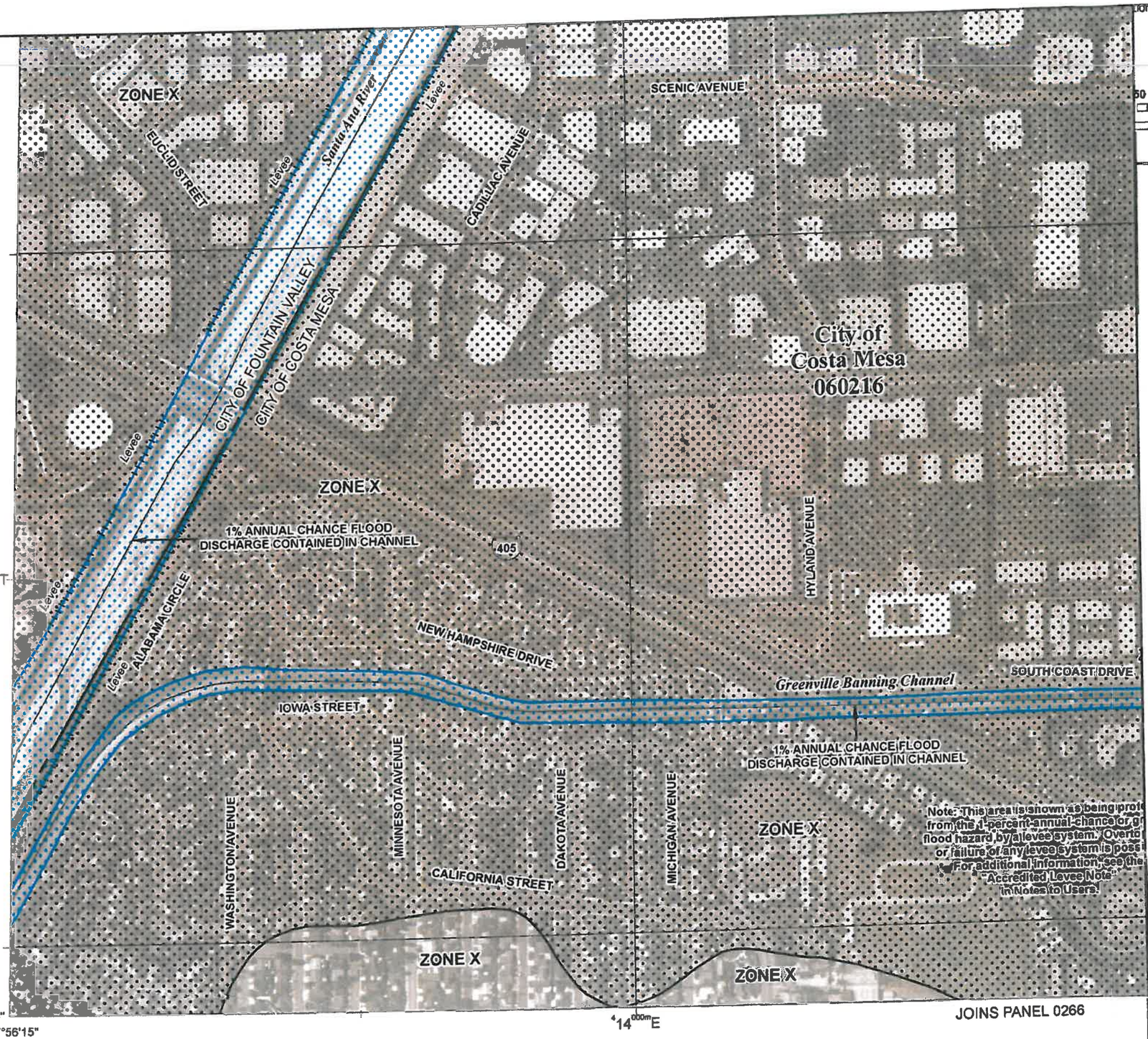
GREENVILLE BANNING CHANNEL

tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS



PANEL 0258J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 258 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COSTA MESA, CITY OF	060216	0258	J
FOUNTAIN VALLEY, CITY OF	060218	0258	J
SANTA ANA, CITY OF	060212	0258	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

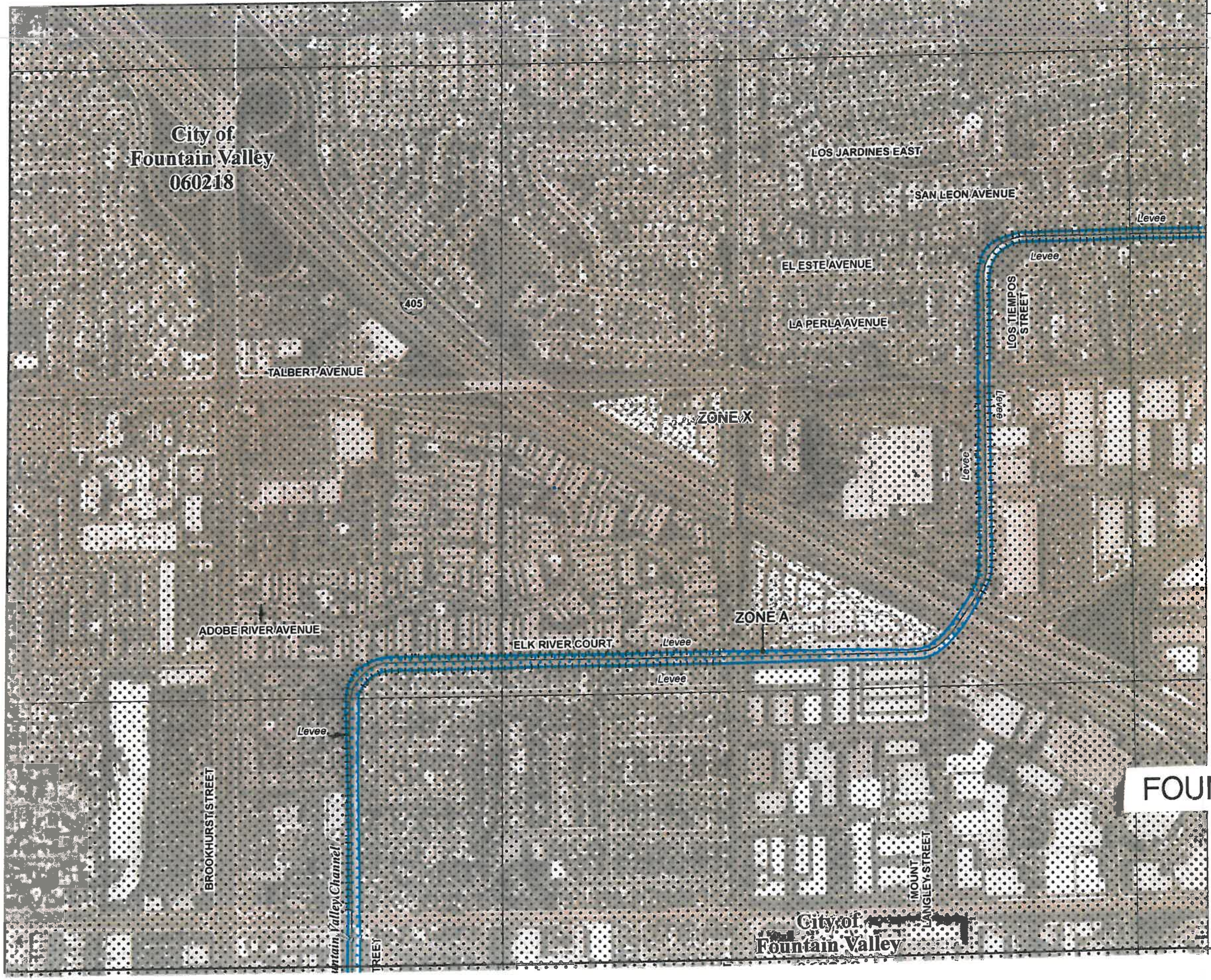
MAP NUMBER
06059C0258J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

SANTA ANA RIVER



...ional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

METERS

PANEL 0254J

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 254 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COSTA MESA, CITY OF	060216	0254	J
FOUNTAIN VALLEY, CITY OF	060218	0254	J

Notice to User: The Map Number shown below should be used when placing map orders, the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06059C0254J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

FOUNTAIN VALLEY CHANNEL

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117°58'07.5"
'07.5"
6040000 FT
JOINS PANEL 0252
6045000 FT
DAISY AVENUE
MARIPOSA AVENUE
Ocean V
EMMONS CIRCLE
WINTHROP CIRCLE
Ocean View Channel
ZONE A
ZONE A
ZONE X
BUTTONWOOD STREET
BROOKHURST STREET
LA ESTRELLA AVENUE
405
BUSHARD STREET
SLATER AVENUE
LIMIT OF STUDY
Talbert Channel (D02)
ZONE X
ZONE A
FT

tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0254J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 254 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COSTA MESA, CITY OF	065116	0254	J
FOUNTAIN VALLEY, CITY OF	065210	0254	J

Notice to User. The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

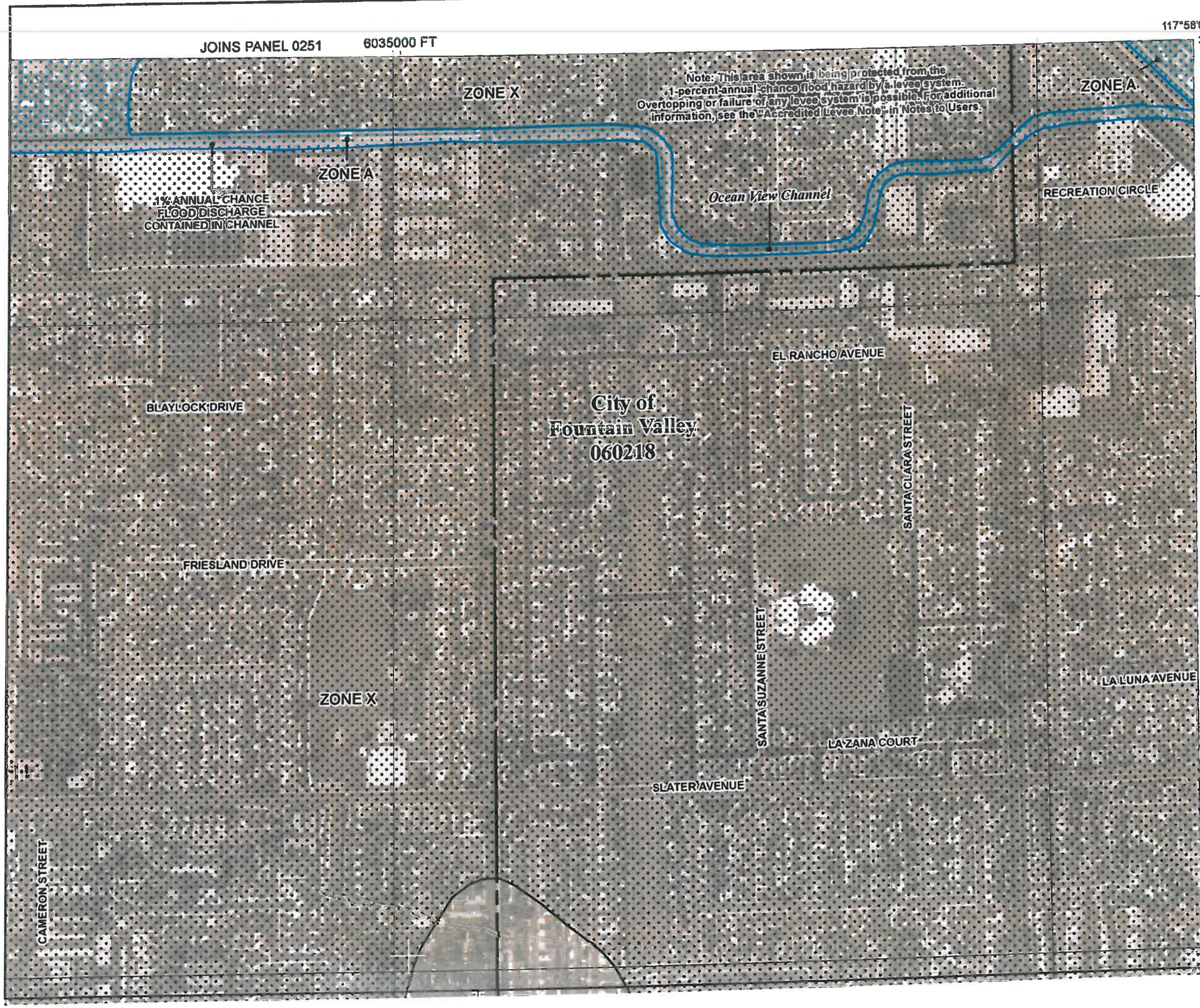
MAP NUMBER
06059C0254J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

OCEAN VIEW CHANNEL

1 OF 2



...onal Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0253J

FIRM
FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 253 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
FOUNTAIN VALLEY, CITY OF	060218	0253	J
HUNTINGTON BEACH, CITY OF	06503-	0253	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06059C0253J

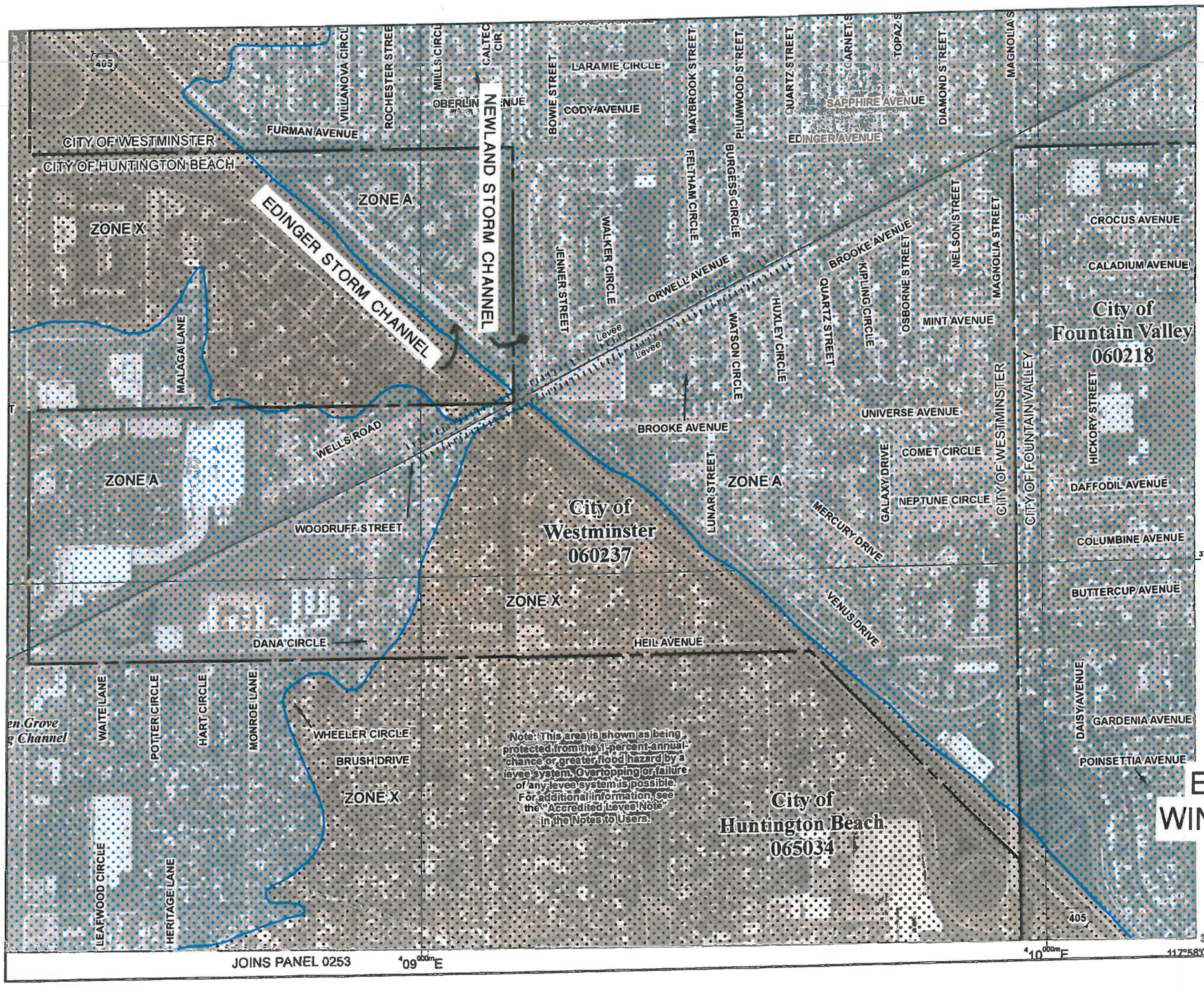
MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

OCEAN VIEW CHANNEL

2 OF 2

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS

PANEL 0251J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 251 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
FOUNTAIN VALLEY, CITY OF	060218	0251	J
HUNTINGTON BEACH, CITY OF	065034	0251	J
ORANGE COUNTY	060227	0251	J
WESTMINSTER, CITY OF	060230	0251	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER 06059C0251J

MAP REVISED DECEMBER 3, 2009

Federal Emergency Management Agency

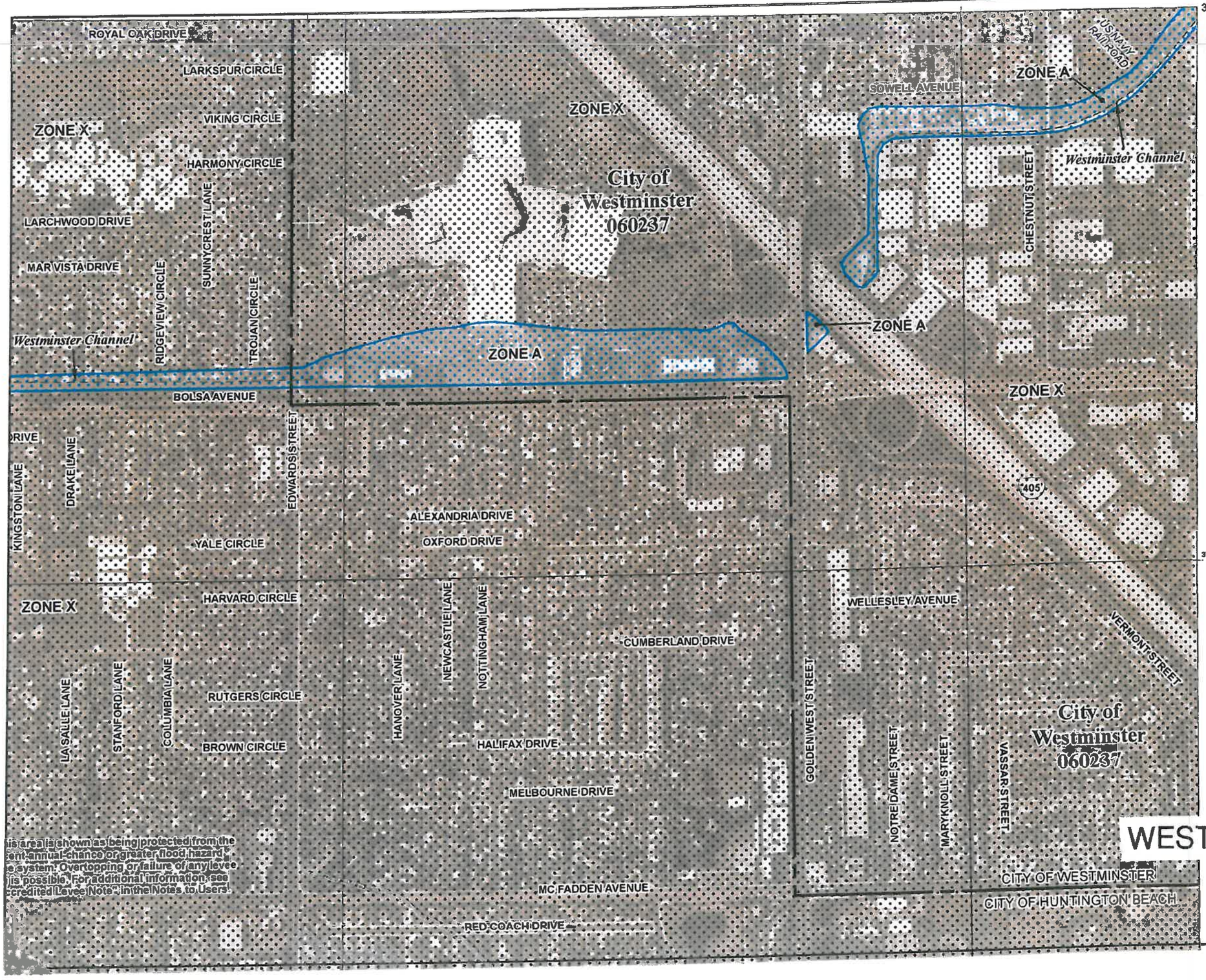
NATIONAL FLOOD INSURANCE PROGRAM

EAST GARDEN GROVE WINTERSBURG CHANNEL

EDINGER CHANNEL

NEWLAND CHANNEL

Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



WESTMINSTER CHANNEL

tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS

PANEL 0232J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 232 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HUNTINGTON BEACH, CITY OF	065024	0232	J
WESTMINSTER, CITY OF	060237	0232	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER 06059C0232J

MAP REVISED DECEMBER 3, 2009

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

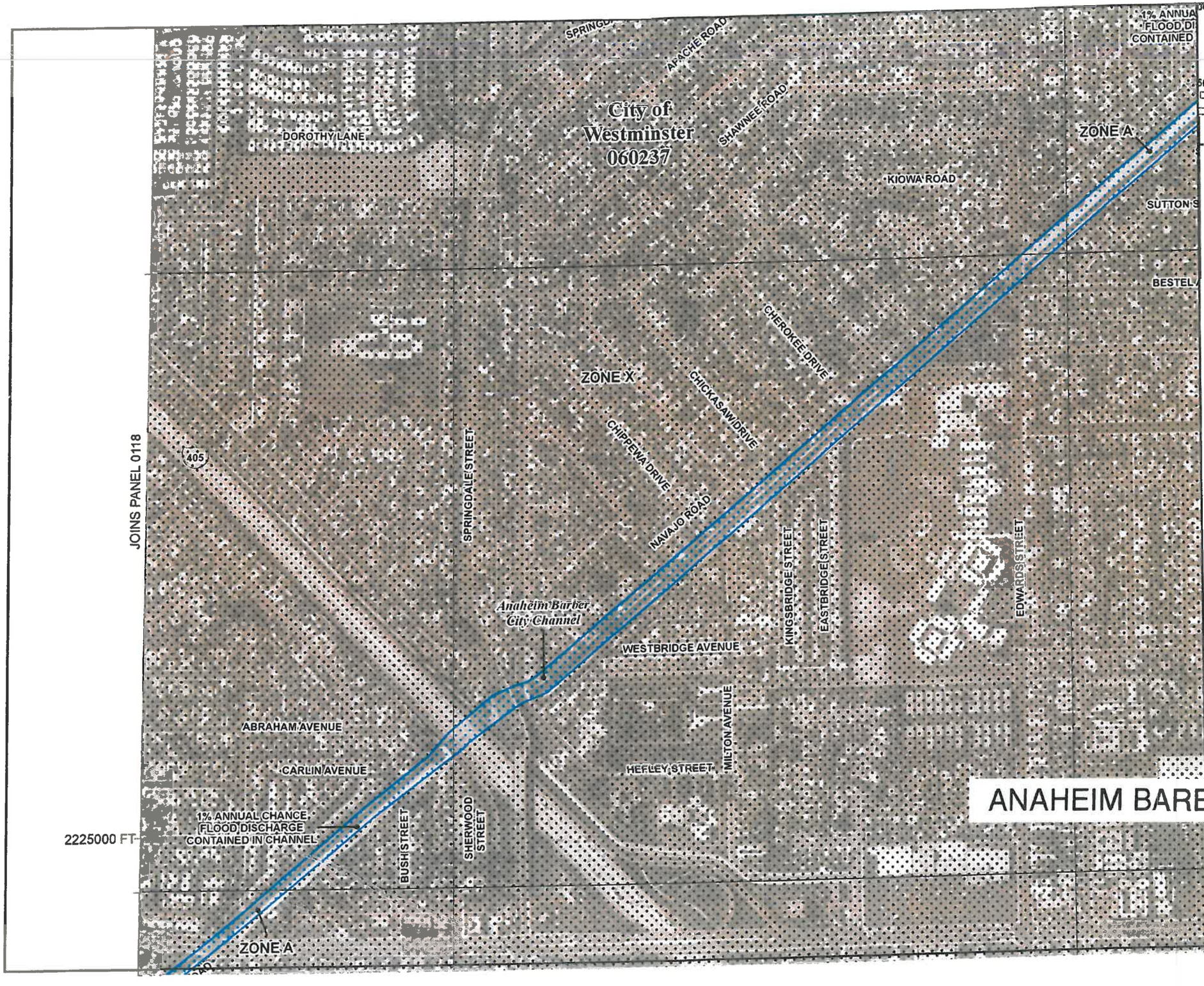
tional Flood Insurance Program at 1-800-638-6620.

1% ANNUA
FLOOD DI
CONTAINED

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS



PANEL 0119J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 119 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BARDE[illegible] E CITY OF	060220	0119	J
HUNT[illegible]TO BEACH, CITY OF	0[illegible]3034	0119	J
WESTMINSTER CITY OF	060[illegible]7	0119	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06059C0119J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

ANAHEIM BARBER CITY CHANNEL

6015000 FT JOINS PANEL 0116

ional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS

Golf Course Retarding Basin

ZONE X

ZONE AE (EL 14)

IRONWOOD AVENUE

HAZELNUT AVENUE

GUAVA AVENUE

LAMPSON AVENUE

FIR AVENUE

City of Seal Beach 060233

ELDER AVENUE

DOGWOOD AVENUE

CANDLEBERRY AVENUE

BIRCHWOOD AVENUE

ALMOND AVENUE

ASTER STREET

ZONE X

ZONE A

WISTERIA STREET

BARTLETT

ZONE X

Bolsa Chica Channel

1% FL CON

VIOLET STREET

405

DY0650

DY0647

DY0649

DY0646

DY0648

DY0645

DY0651

Note: This area is shown as being protected from the 1-percent-annual-chance or greater flood hazard by a levee system that has been provisionally accredited. Overtopping or failure is possible. For additional information, see the "Provisionally Accredited Levee Note" in Notes to Users.

ZONE D AND MILITARY BOUNDARIES COINCIDENT WITH CORPORATE LIMITS

ZONE D

Orange County Unincorporated Areas 060212

LIMIT OF STUDY

LIMIT OF STUDY

BOLSA CHICA CHANNEL

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0118J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 118 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GARDEN GR. E, IT .S	060 .0	011	J
HUNTINGTON BEACH, CITY OF	025034	0118	J
ORANGE COUNTY	0 021	0118	J
SEAL BEACH, CITY OF	0 .52	0118	J
WESTMINSTER, CITY OF	0 .37	011	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER 06059C0118J

MAP REVISED DECEMBER 3, 2009

Federal Emergency Management Agency

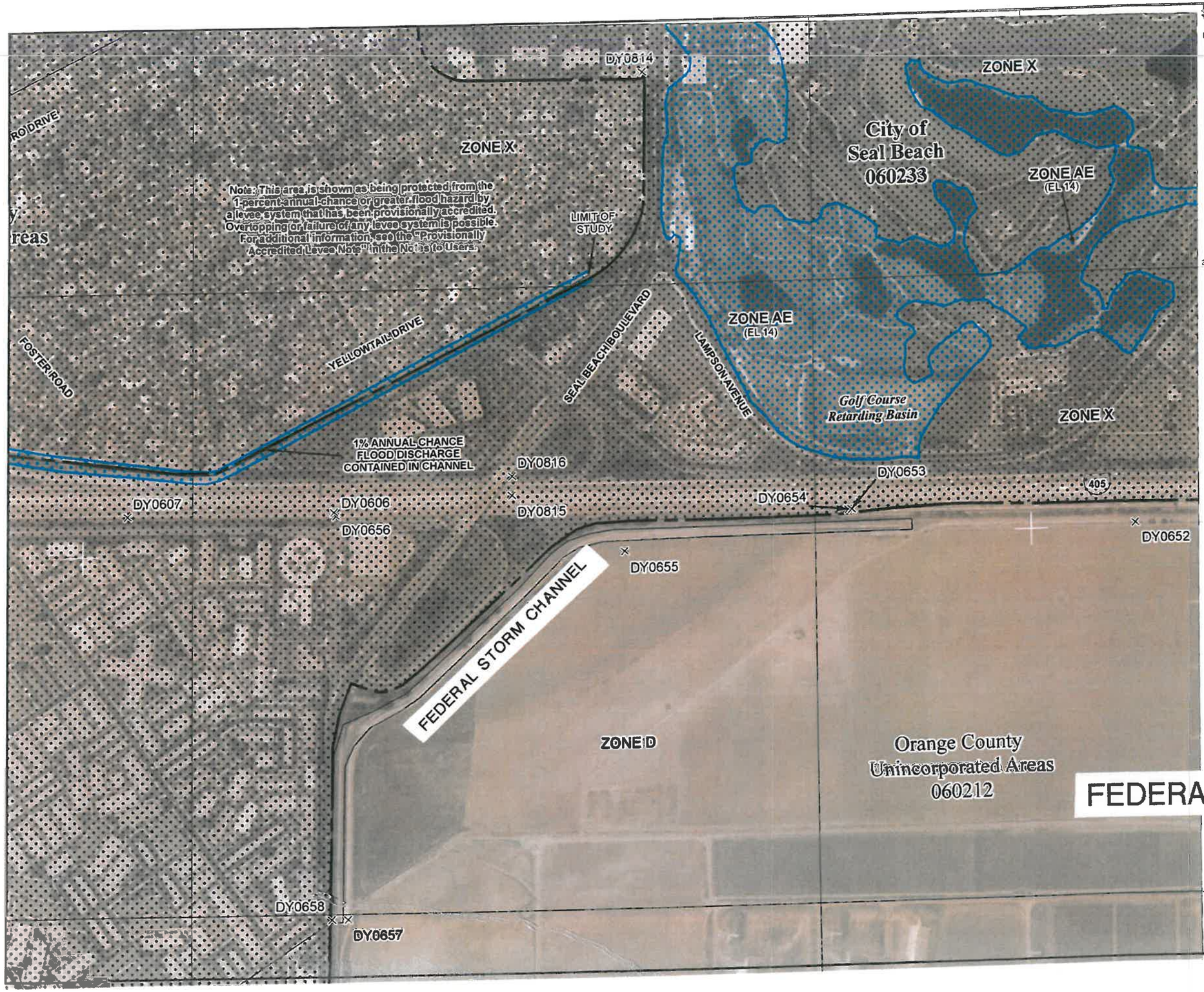
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0114J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 114 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY	060212	0114	J
SEAL BEACH, CITY OF	060233	0114	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER 06059C0114J

MAP REVISED DECEMBER 3, 2009

Federal Emergency Management Agency

FEDERAL STORM CHANNEL

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

6005000 FT

JOINS PANEL 0112

1% ANNUAL CHANCE FLOOD DISCHARGE CONTAINED IN CHANNEL

ZONE X

CITY OF SEAL BEACH

ORANGE COUNTY

COPA DE ORO DRIVE

Montecito Storm Channel

COLLEGE PARK DRIVE

Orange County
Unincorporated Areas
060212

Note: This area is shown as being protected from the 1-percent-annual-chance or greater flood hazard by a levee system that has been provisionally accredited. Overtopping or failure of any levee system is possible. For additional information, see the "Provisionally Accredited Levee Note" in the Notes to Users.

ZONE X

MARTHA ANN DRIVE

FOSTER ROAD

YELLOWTAIL DRIVE

ZONE X

1% ANNUAL CHANCE FLOOD DISCHARGE CONTAINED IN CHANNEL

DY0816

1% ANNUAL CHANCE FLOOD DISCHARGE CONTAINED IN CHANNEL

Bixby Storm Channel

ZONE A

DY0611

DY0607

DY0606

DY0815

DY0612

405

DY0610

DY0656

City of
Seal Beach
060233

1% ANNUAL CHANCE FLOOD DISCHARGE CONTAINED IN CHANNEL

ZONE X

DY0658

DY0657

MONTECITO STORM CHANNEL

BIXBY STORM CHANNEL

...tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0114J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 114 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY	060212	0114	J
SEAL BEACH, CITY OF	060233	0114	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community

MAP NUMBER
06059C0114J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

APPENDIX B

PHOTOS

Montecito Storm Channel

Photo Date: July 23, 2009

Direction: Picture taken facing southwest, from east of I-405.

Bixby Storm Channel

Photo Date: July 29, 2009

Direction: Picture taken facing south and east of I-405

Bixby Storm Channel

Photo Date: August 4, 2009

Direction: Picture taken facing west and north of I-405.

Federal Storm Channel

Photo Date: Google 2009

Direction: Picture taken facing northeast from south of I-405.

Federal Storm Channel

Photo Date: July 23, 2009

Direction: Picture taken facing east from south of I-405.

Bolsa Chica Channel

Photo Date: April 28, 2010

Direction: Picture taken facing North, from south of I-405.

Milan Storm Drain

Photo Date: April 28, 2010

Direction: Picture taken facing north, from south of I-405.

Anaheim Barber Channel

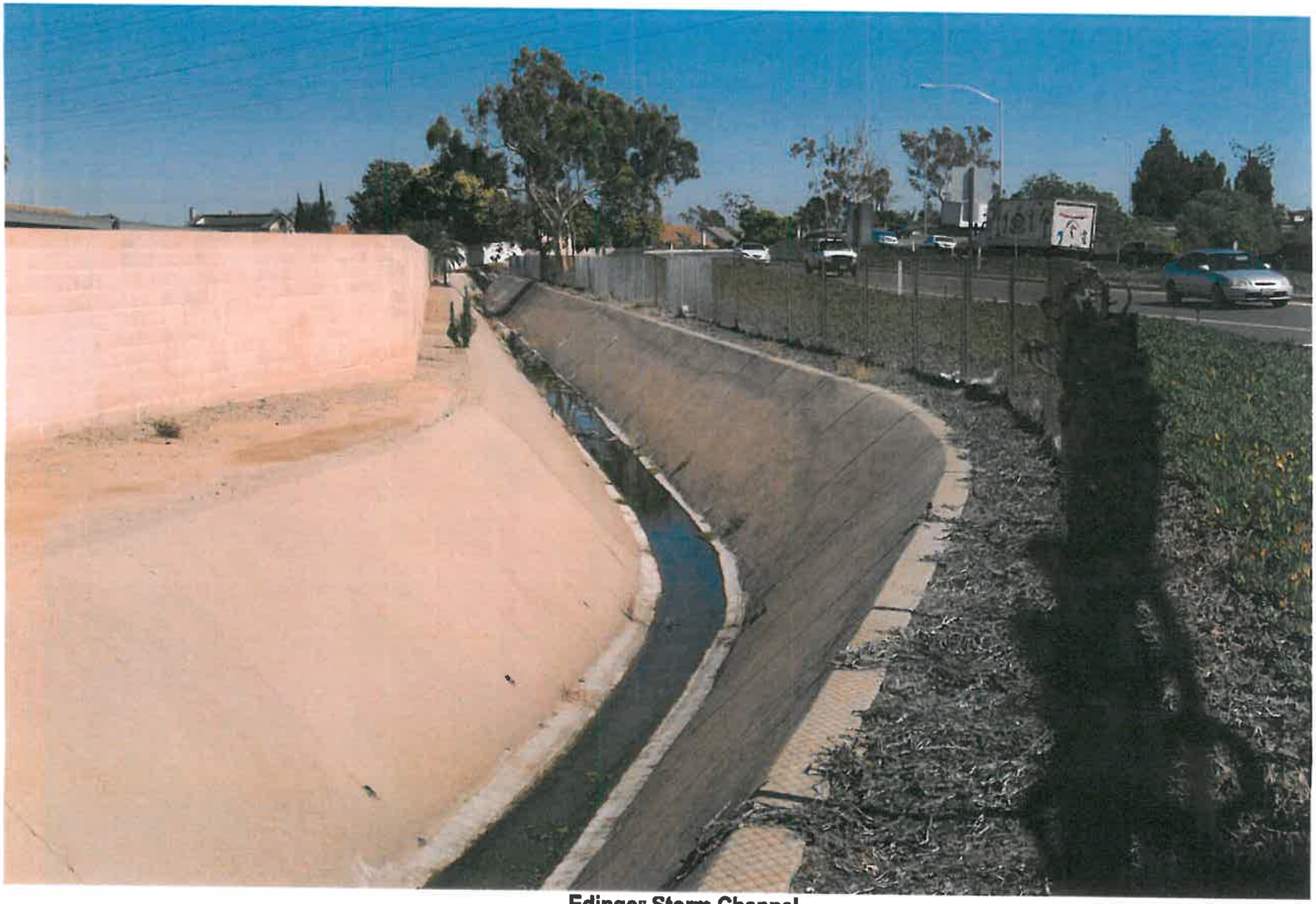
Photo Date: July 23, 2009

Direction: Picture taken facing southwest, from north of I-405.

Westminster Channel

Photo Date: July 27, 2009

Direction: Picture taken facing Northeast (Northwest of the intersection Bolsa Ave/Goldenwest St.)



Edinger Storm Channel

Photo Date: August 4, 2009

Direction: Picture taken facing southeast, from north of I-405.

Newland Storm Channel

Photo Date: August 4, 2009

Direction: Picture taken facing south, from north of I-405.

Newland Storm Channel

Photo Date: April 28, 2010

Direction: Picture taken facing north, from north of I-405.

East Garden Grove Wintersburg Channel

Photo Date: August 4, 2009

Direction: Picture taken facing southeast, north of I-405.

East Garden Grove Wintersburg Channel

Photo Date: August 4, 2009

Direction: Picture taken facing northeast, south of I-405.

Ocean View Channel

Photo Date: July 28, 2009

Direction: Picture taken facing southeast, from north of I-405.

Fountain Valley Channel

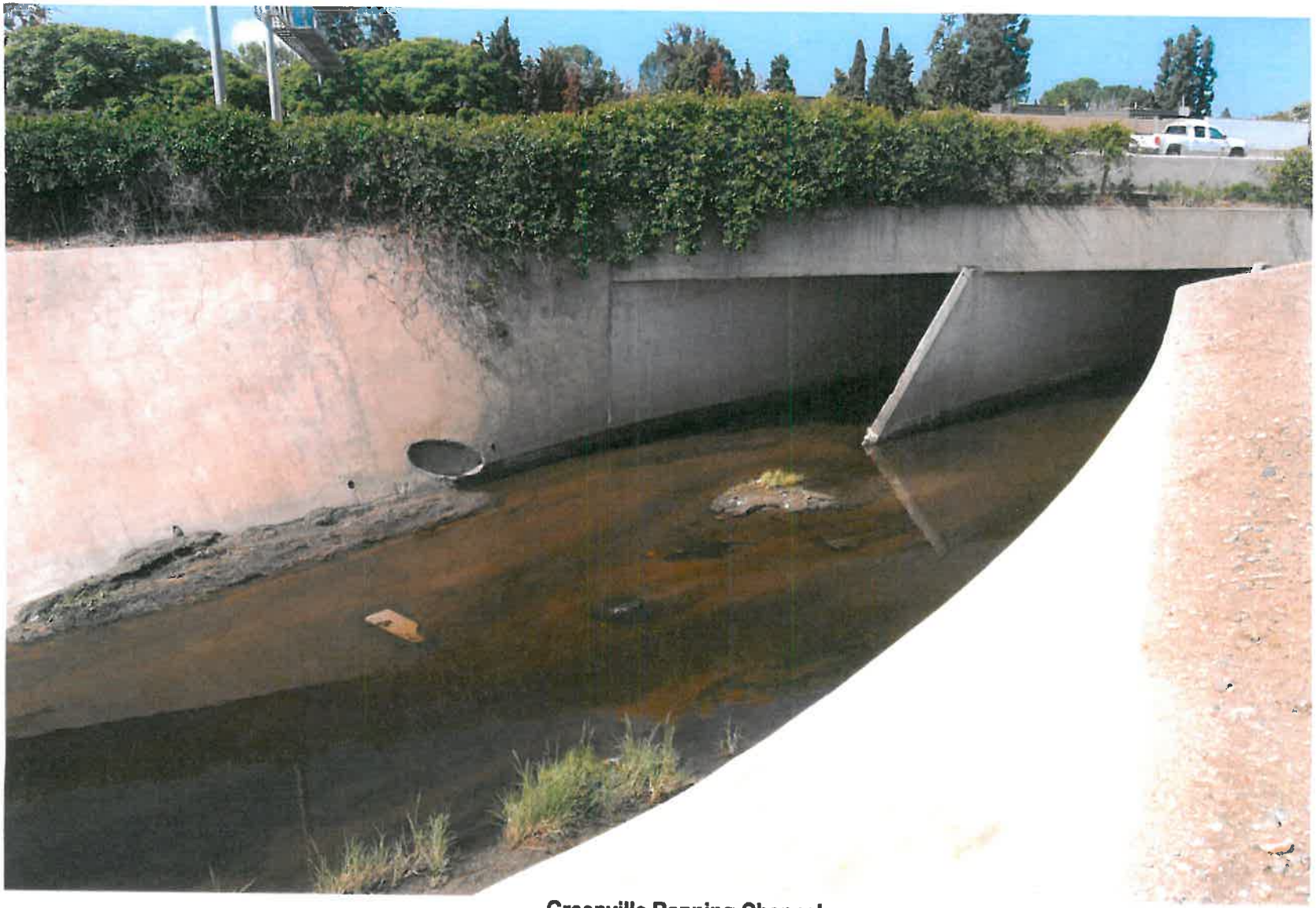
Photo Date: July 28, 2009

Direction: Picture taken facing southwest, from south of I-405.

Santa Ana River

Photo Date: July 29, 2009

Direction: Picture taken facing northwest, from north of I-405. Drains from northeast to southwest and towards the Pacific Ocean.



Greenville Banning Channel

Photo Date: April 28, 2010

Direction: Picture taken facing southwest, from north of I-405.

Gisler Storm Channel, west of Fairview Rd.

Photo Date: April 4, 2009

Direction: Picture taken facing west, from north of I-405.

Gisler Storm Channel, east of Fairview Rd.

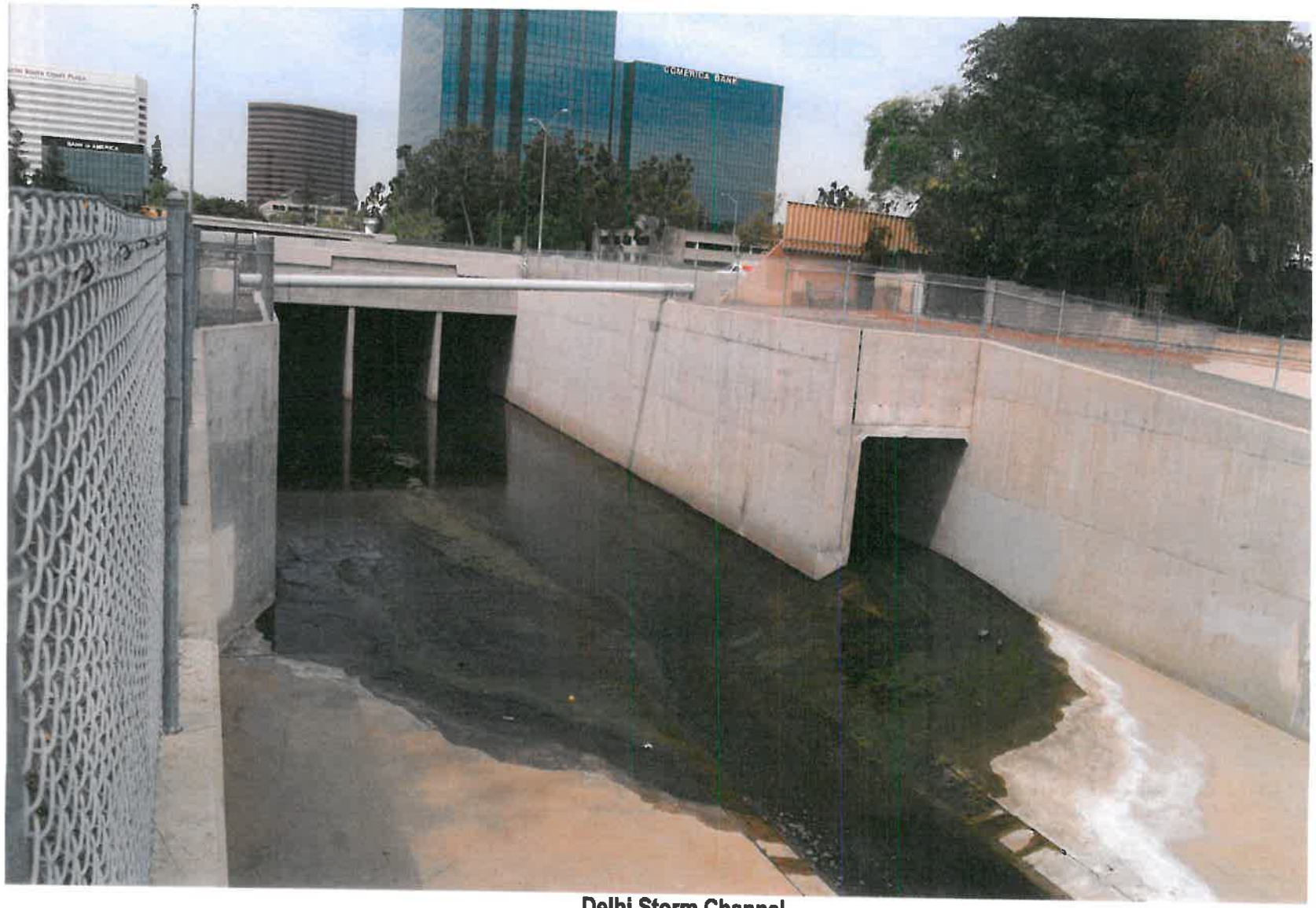
Photo Date: April 4, 2009

Direction: Picture taken facing east, from north of I-405.

Delhi Storm Channel

Photo Date: April 27, 2010

Direction: Picture taken facing South, from north of I-405.



Delhi Storm Channel

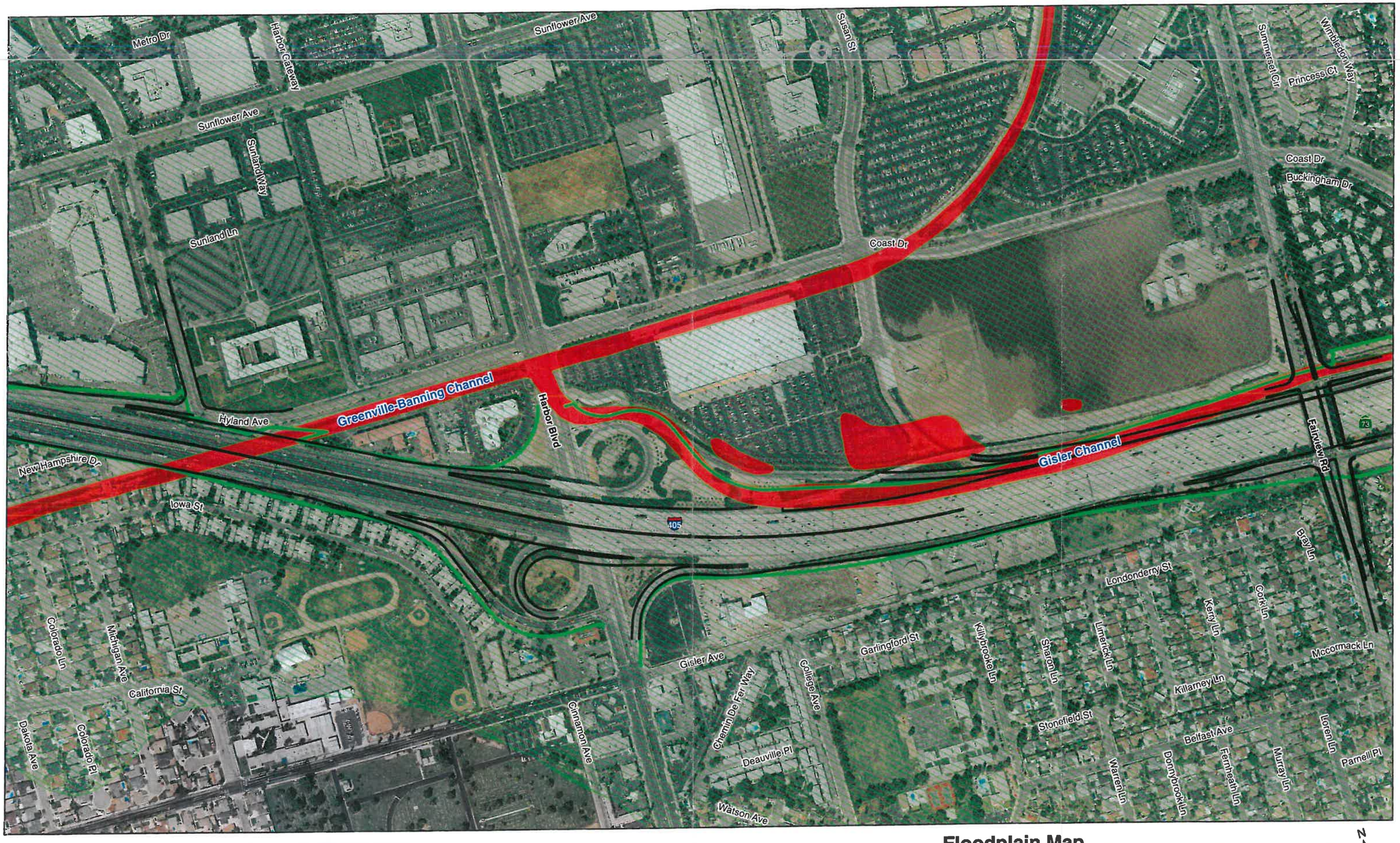
Photo Date: April 27, 2010

Description: Picture taken facing North, from south of I-405.

APPENDIX C

PROPOSED ROADWAY IMPROVEMENTS

ADJACENT TO FLOODPLAINS



Proposed New Edge of Roadway
Right-of-Way

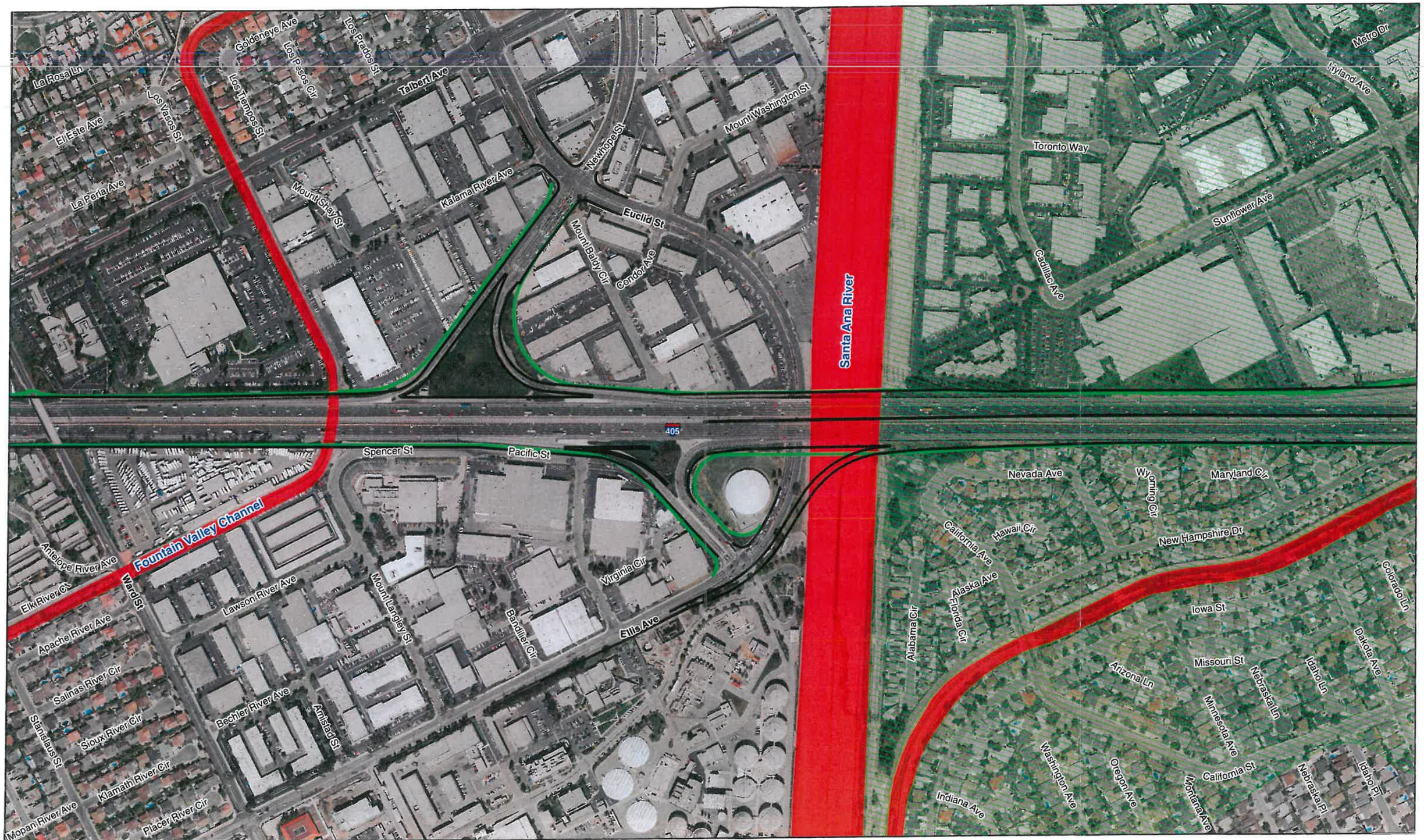
Flood Hazard Zones

A	AH	OPEN WATER	
AE	AO	X	
	D	X PROTECTED BY LEVEE	

Floodplain Map
1 of 9

0 250 500 1,000 Feet

N



Proposed New Edge of Roadway
Right-of-Way

Flood Hazard Zones

A
AE
AH
AO
D
OPEN WATER
X
X PROTECTED BY LEVEE

Floodplain Map
2 of 9

0 250 500 1,000 Feet

N

Hickory St
Elm Cir
Rose Ave
Buttemut Cir
El Greco Cir
Nectarine St
La Zapatilla Cir
Olive St
Mariposa Ave
Foxglove Ave
Daffodil Ave
Columbine Ave
Buttercup Ave
Walnut St
Oak Cir
Greenleaf St
La Esperanza Ave
El Durango Cir
Helena Cir
Pearl Ave
Willow Cir
Magnolia St
Ponderosa St
Teak Cir
Comet Cir
Gardenia Ave
Orange St
La Granada Ave
Neptune Cir
Mulberry Cir
Clover Ct
Plumas Ct
La Mora Cir
Sparkleberry St
Maple St
Galaxy Dr
Heil Ave
Maza Cir
Daisy Ave
Poinsettia Ave
Milky Way
Apricot Cir
La Capilla Ave
Pine Cir
Emery Ct
Bushard St
Mercury Dr
Oleander Cir
El Portal Cir
Venus Dr
Daisy Ave
Buttonwood St
Warner Ave
405
Landau Ln
Savoy Cir
De Ville Cir
Ocean View Channel
Recreation Cir
Modoc St
El Rey Ave
Poplar St
Wagers Cir
Magnolia St
El Cortez Ave
Royer Cir
Juniper St
Laurel St
La Estrella Ave
Ash St
La Luna Ave
Parker Cir
Ross Ln
Royal Dr
Conner Dr
Derek Cir
Warner Ave
La Paloma Ave
La Colonia Ave
Elm St
Roque Ln
Jarrett Cir
Riverbend Dr
La Casita Ave
Slater Ave
Lamar Dr
Oak St
Elder St
El Vale Ave
Palm St
La Stella Ave
El Sol Ave
Walnut St
Orinda Cir
Lucia Ln
Kent Cir
Anthony Dr
Asari Ln
El Blanco Ave

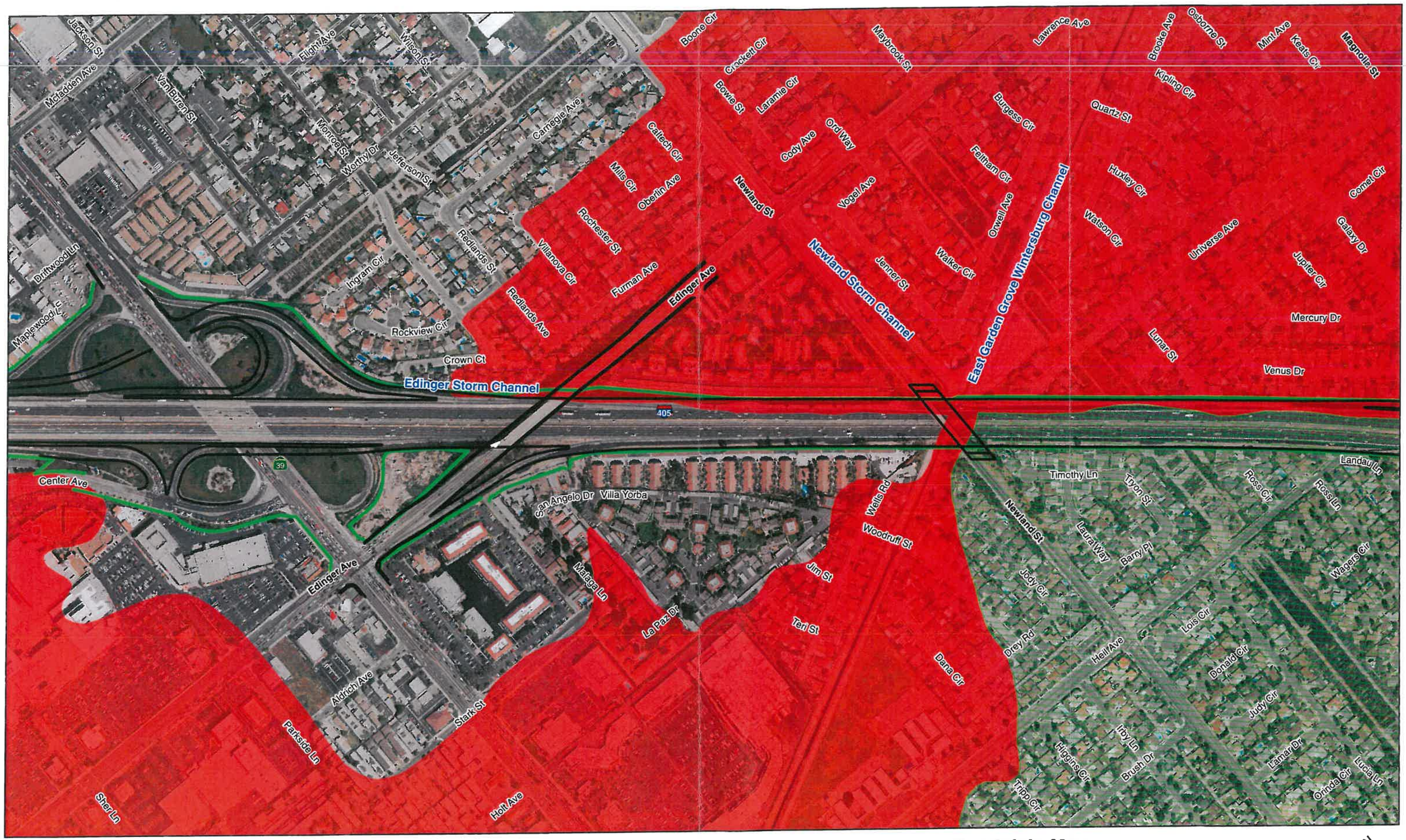
Proposed New Edge of Roadway
Right-of-Way

Flood Hazard Zones
A
AE
AH
AO
D
OPEN WATER
X
X PROTECTED BY LEVEE

Floodplain Map
3 of 9

0 250 500 1,000 Feet

N



Proposed New Edge of Roadway
Right-of-Way

Flood Hazard Zones

A
AE
AH
AO
D
OPEN WATER
X
X PROTECTED BY LEVEE

Floodplain Map
4 of 9

0 250 500 1,000 Feet

N

Proposed New Edge of Roadway
Right-of-Way

Flood Hazard Zones

A
AE
AH
AO
D
OPEN WATER
X
X PROTECTED BY LEVEE

Floodplain Map
5 of 9

0 250 500 1,000 Feet

N

Proposed New Edge of Roadway
Right-of-Way

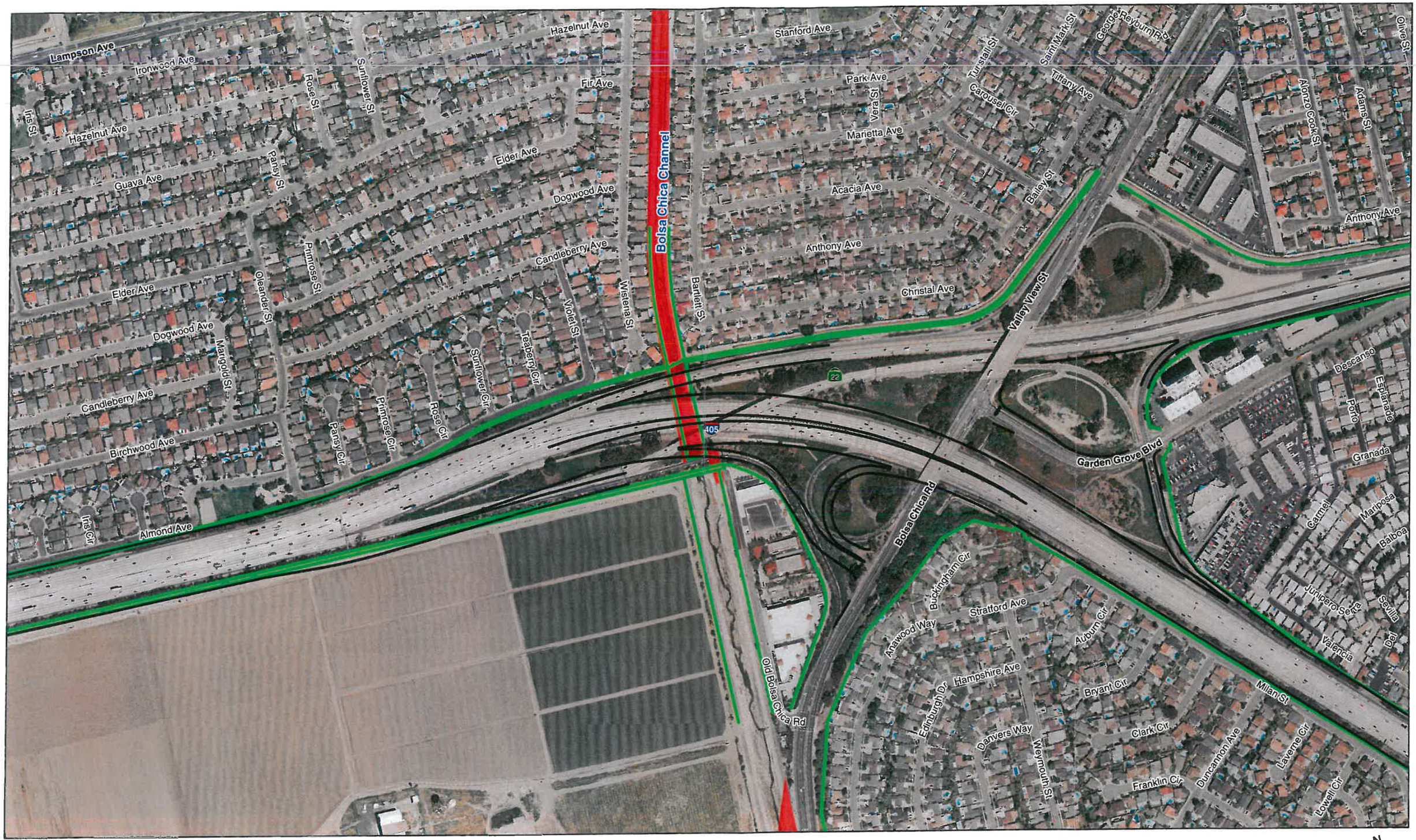
Flood Hazard Zones

A
AE
AH
AO
D
OPEN WATER
X
X PROTECTED BY LEVEE

Floodplain Map
6 of 9

0 250 500 1,000 Feet

N



Proposed New Edge of Roadway
Right-of-Way

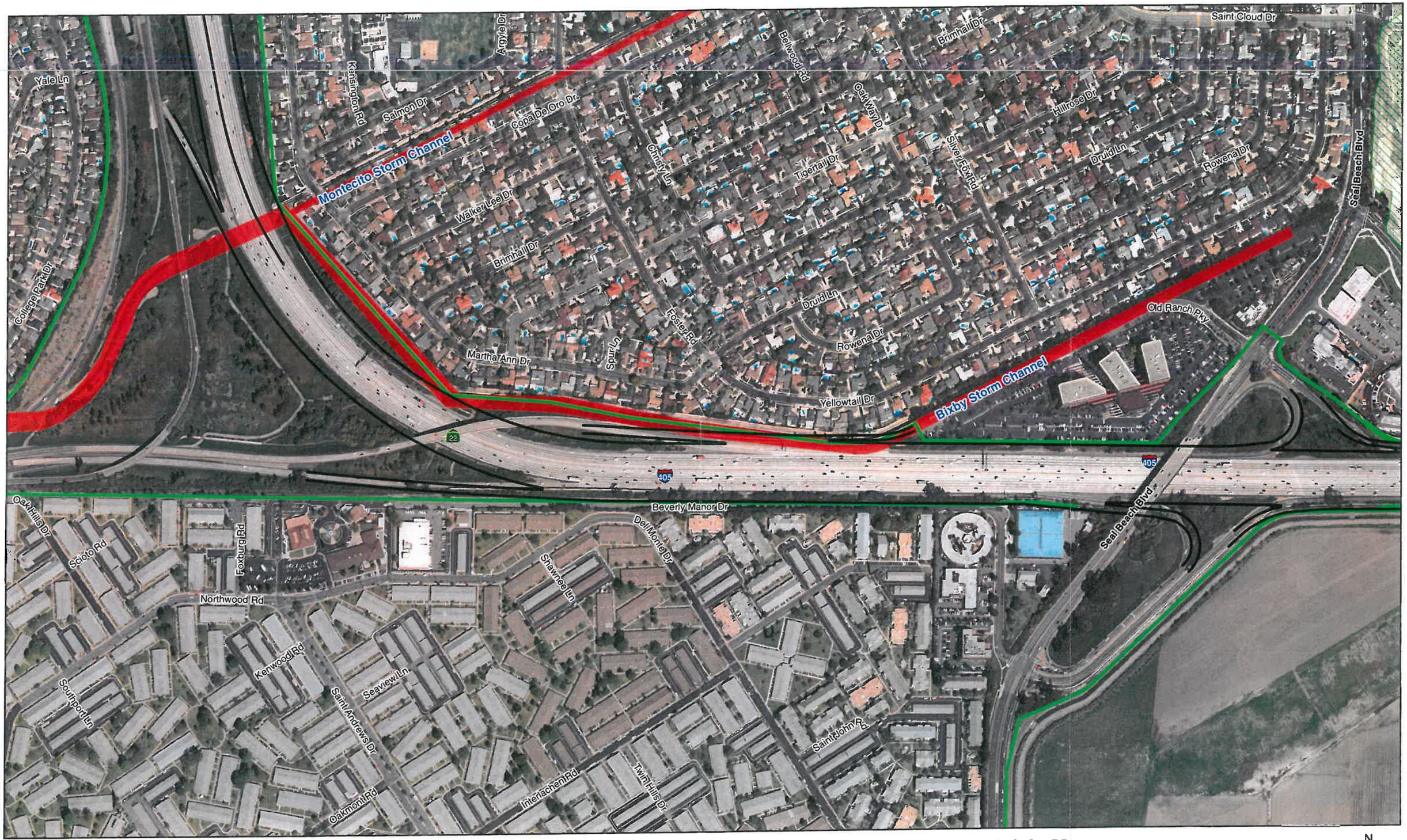
Flood Hazard Zones

A
AE
AH
AO
D
OPEN WATER
X
X PROTECTED BY LEVEE

Floodplain Map
7 of 9

0 250 500 1,000 Feet

N



Proposed New Edge of Roadway
Right-of-Way

Flood Hazard Zones
A
AE
AH
AO
D
OPEN WATER
X
X PROTECTED BY LEVEE

Floodplain Map
9 of 9

0 250 500 1,000 Feet

N

APPENDIX D

LOCATION HYDRAULIC STUDY FORMS

LOCATION HYDRAULIC STUDY FORM

Dist. 12 Co. OC Rte. 405 P.M. 9.89/11.45
EA 71621 Bridge No. N/A
Floodplain Description: Gisler Storm Channel

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

Roadway widening may impact flood structures during construction, but will be restored to original state.

2. ADT: Current 307,000 Projected 435,000 (Alt. 3)

3. Hydraulic Data: Base Flood Q_{100}= Unknown ft^3 / s
WSE_{100}= Unknown The flood of record, if greater than Q_{100}:
Q= Unknown ft^3 / s WSE= Unknown
Overtopping flood Q= Unknown m^3 / s WSE= Unknown
Are NFIP maps and studies available? YES X NO

4. Is the highway location alternative within a regulatory floodway ?
YES NO X

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q_{100} backwater damages:

A. Residences?	NO X	YES
B. Other Bldgs?	NO X	YES
C. Crops?	NO X	YES
D. Natural and beneficial floodplain values?	NO X	YES

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO	YES X
B. Emergency vehicle access?	NO	YES X
C. Practicable detour available?	NO X	YES
D. School bus or mail route?	NO X	YES

7. Estimated duration of traffic interruption for 100-year event hours: 0

8. Estimated value of Q_{100} flood damages (if any) – moderate risk level.

A.	Roadway	$ 0
B.	Property	$ 0
	Total	$ 0

9 Assessment of Level of Risk

Low X
Moderate ____
High ____

For High Risk projects, during design phase, additional Design Study Risk Analysis May be necessary to determine design alternative.

Signature – Dist. Hydraulic Engineer (Item numbers 3,4,5,7,9) Kathlyne Lam Date 4-5-11

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development?

NO X YES ____

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

Signature – Dist. Project Engineer (Item numbers 1,2,6,8) Date 4/5/11

LOCATION HYDRAULIC STUDY FORM

Dist. 12 Co. OC Rte. 405 P.M. 11.70
EA 071621 Bridge No. 55 0476
Floodplain Description: Greenville Banning Channel

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

Roadway widening over 3-12x12 RCB, extend existing RCB on upstream side.

2. ADT: Current 307,000 Projected 435,000 (Alt. 3)

3. Hydraulic Data: Base Flood Q_{100}= 3,450 ft^3 / s
WSE_{100}= Unknown The flood of record, if greater than Q_{100}:
Q= Unknown ft^3 / s WSE= Unknown
Overtopping flood Q= Unknown m^3 / s WSE= Unknown
Are NFIP maps and studies available? YES X NO

4. Is the highway location alternative within a regulatory floodway ?
YES NO X

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q_{100} backwater damages:

A. Residences?	NO X	YES
B. Other Bldgs?	NO X	YES
C. Crops?	NO X	YES
D. Natural and beneficial floodplain values?	NO X	YES

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO	YES X
B. Emergency vehicle access?	NO	YES X
C. Practicable detour available?	NO X	YES
D. School bus or mail route?	NO X	YES

7. Estimated duration of traffic interruption for 100-year event hours: 0

8. Estimated value of Q_{100} flood damages (if any) – moderate risk level.

A.	Roadway	$ 0
B.	Property	$ 0
	Total	$ 0

9 Assessment of Level of Risk

Low X
Moderate ____
High ____

For High Risk projects, during design phase, additional Design Study Risk Analysis May be necessary to determine design alternative.

Signature – Dist. Hydraulic Engineer (Item numbers 3,4,5,7,9) Kathlyne Lane Date 4-5-11

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development?

NO X YES ____

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

Signature – Dist. Project Engineer (Item numbers 1,2,6,8) Date 4/5/11

LOCATION HYDRAULIC STUDY FORM

Dist. 12 Co. OC Rte. 405 P.M. 12.41
EA 071621 Bridge No. 55 0258
Floodplain Description: Santa Ana River

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

Bridge widening, pier wall extension, new pier walls for Euclid on-ramp.

2. ADT: Current 307,000 Projected 435,000 (Alt. 3)

3. Hydraulic Data: Base Flood Q_{100}= 47,000 ft^3 / s
WSE_{100}= Unknown The flood of record, if greater than Q_{100}:
Q= Unknown ft^3 / s WSE= Unknown
Overtopping flood Q= Unknown m^3 / s WSE= Unknown
Are NFIP maps and studies available? YES X NO

4. Is the highway location alternative within a regulatory floodway ?
YES X NO

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q_{100} backwater damages:

A. Residences?	NO X	YES
B. Other Bldgs?	NO X	YES
C. Crops?	NO X	YES
D. Natural and beneficial floodplain values?	NO X	YES

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO	YES X
B. Emergency vehicle access?	NO	YES X
C. Practicable detour available?	NO X	YES
D. School bus or mail route?	NO X	YES

7. Estimated duration of traffic interruption for 100-year event hours: 2

8. Estimated value of Q_{100} flood damages (if any) – moderate risk level.

A.	Roadway	$ 0
B.	Property	$ 0
	Total	$ 0

9 Assessment of Level of Risk

Low X
Moderate ____
High ____

For High Risk projects, during design phase, additional Design Study Risk Analysis May be necessary to determine design alternative.

Signature – Dist. Hydraulic Engineer (Item numbers 3,4,5,7,9) Kathlyne Lane Date 9-5-11

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development?

NO ____ YES X

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

Signature – Dist. Project Engineer (Item numbers 1,2,6,8) Date 4/5/11

LOCATION HYDRAULIC STUDY FORM

Dist. 12 Co. OC Rte. 405 P.M. 12.87
EA 071621 Bridge No. N/A
Floodplain Description: Fountain Valley Channel

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

Roadway widening over 2-10x7 RCB, lengthen culvert, modify inlet and outlet structures.

2. ADT: Current 307,000 Projected 435,000 (Alt. 3)

3. Hydraulic Data: Base Flood Q_{100}= 172 ft^3 / s
WSE_{100}= Unknown The flood of record, if greater than Q_{100}:
Q= Unknown ft^3 / s WSE= Unknown
Overtopping flood Q= Unknown m^3 / s WSE= Unknown
Are NFIP maps and studies available? YES X NO

4. Is the highway location alternative within a regulatory floodway ?
YES NO X

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q_{100} backwater damages:

A. Residences?	NO X	YES
B. Other Bldgs?	NO X	YES
C. Crops?	NO X	YES
D. Natural and beneficial floodplain values?	NO X	YES

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO	YES X
B. Emergency vehicle access?	NO	YES X
C. Practicable detour available?	NO X	YES
D. School bus or mail route?	NO X	YES

7. Estimated duration of traffic interruption for 100-year event hours: 2

8. Estimated value of Q_{100} flood damages (if any) – moderate risk level.

A.	Roadway	$	0
B.	Property	$	0
	Total	$	0

9 Assessment of Level of Risk

Low X
Moderate ____
High ____

For High Risk projects, during design phase, additional Design Study Risk Analysis May be necessary to determine design alternative.

Signature – Dist. Hydraulic Engineer Kathleen Lane Date 4-5-11
(Item numbers 3,4,5,7,9)

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development?

NO X YES ____

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

Signature – Dist. Project Engineer _____ Date 4/5/11
(Item numbers 1,2,6,8)

LOCATION HYDRAULIC STUDY FORM

Dist. 12 Co. OC Rte. 405 P.M. 14.50/16.98
EA 071621 Bridge No. 55 0478
Floodplain Description: Ocean View Channel

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

Roadway widening over 2-12x9.5 RCB, lengthen culvert upstream.

2. ADT: Current 257,000 Projected 352,000 (Alt. 3)

3. Hydraulic Data: Base Flood Q_{100}= 1,930 ft^3 / s
WSE_{100}= Unknown The flood of record, if greater than Q_{100}:
Q= Unknown ft^3 / s WSE= Unknown
Overtopping flood Q= Unknown m^3 / s WSE= Unknown
Are NFIP maps and studies available? YES X NO

4. Is the highway location alternative within a regulatory floodway ?
YES NO X

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q_{100} backwater damages:

A. Residences?	NO X	YES
B. Other Bldgs?	NO X	YES
C. Crops?	NO X	YES
D. Natural and beneficial floodplain values?	NO X	YES

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO	YES X
B. Emergency vehicle access?	NO	YES X
C. Practicable detour available?	NO X	YES
D. School bus or mail route?	NO X	YES

7. Estimated duration of traffic interruption for 100-year event hours: 2

8. Estimated value of Q_{100} flood damages (if any) – moderate risk level.

A.	Roadway	$ 0
B.	Property	$ 0
	Total	$ 0

9 Assessment of Level of Risk

Low X
Moderate ____
High ____

For High Risk projects, during design phase, additional Design Study Risk Analysis May be necessary to determine design alternative.

Signature – Dist. Hydraulic Engineer (Item numbers 3,4,5,7,9) Kathlynne Lane Date 4-5-11

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development?

NO ___X___ YES ____

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

Signature – Dist. Project Engineer (Item numbers 1,2,6,8) _____ Date 4/5/11

LOCATION HYDRAULIC STUDY FORM

Dist. 12 Co. OC Rte. 405 P.M. 14.50/16.98
EA 071621 Bridge No. 55 0480
Floodplain Description: East Garden Grove Wintersburg Channel

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

New bridges over channel, new pier wall at center of channel.

2. ADT: Current 257,000 Projected 352,000 (Alt. 3)

3. Hydraulic Data: Base Flood Q_{100}= 5,910 ft^3 / s
WSE_{100}= Unknown The flood of record, if greater than Q_{100}:
Q= Unknown ft^3 / s WSE= Unknown
Overtopping flood Q= Unknown m^3 / s WSE= Unknown
Are NFIP maps and studies available? YES X NO

4. Is the highway location alternative within a regulatory floodway ?
YES NO X

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q_{100} backwater damages:

A. Residences?	NO X	YES
B. Other Bldgs?	NO X	YES
C. Crops?	NO X	YES
D. Natural and beneficial floodplain values?	NO X	YES

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO	YES X
B. Emergency vehicle access?	NO	YES X
C. Practicable detour available?	NO X	YES
D. School bus or mail route?	NO X	YES

7. Estimated duration of traffic interruption for 100-year event hours: 8

8. Estimated value of Q_{100} flood damages (if any) – moderate risk level.

A.	Roadway	$ 0
B.	Property	$ 0
	Total	$ 0

9 Assessment of Level of Risk

Low X
Moderate ____
High ____

For High Risk projects, during design phase, additional Design Study Risk Analysis May be necessary to determine design alternative.

Signature – Dist. Hydraulic Engineer (Item numbers 3,4,5,7,9) Kathlyne Lare Date 4-5-11

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development?

NO ____ YES X

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

Signature – Dist. Project Engineer (Item numbers 1,2,6,8) Date 4/5/11

LOCATION HYDRAULIC STUDY FORM

Dist. 12 Co. OC Rte. 405 P.M. 20.56/20.91
EA 071621 Bridge No. N/A
Floodplain Description: Milan Storm Drain

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

Roadway widening over 4x4 RCB, lengthen RCB.

2. ADT: Current 257,000 Projected 352,000 (Alt. 3)

3. Hydraulic Data: Base Flood Q_{100}= Unknown ft^3 / s
WSE_{100}= Unknown The flood of record, if greater than Q_{100}:
Q= Unknown ft^3 / s WSE= Unknown
Overtopping flood Q= Unknown m^3 / s WSE= Unknown
Are NFIP maps and studies available? YES X NO

4. Is the highway location alternative within a regulatory floodway ?
YES NO X

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q_{100} backwater damages:

A. Residences?	NO X	YES
B. Other Bldgs?	NO X	YES
C. Crops?	NO X	YES
D. Natural and beneficial floodplain values?	NO X	YES

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO	YES X
B. Emergency vehicle access?	NO	YES X
C. Practicable detour available?	NO X	YES
D. School bus or mail route?	NO X	YES

7. Estimated duration of traffic interruption for 100-year event hours: 0

8. Estimated value of Q_{100} flood damages (if any) – moderate risk level.

A.	Roadway	$ 0
B.	Property	$ 0
	Total	$ 0

9 Assessment of Level of Risk

Low X
Moderate ____
High ____

For High Risk projects, during design phase, additional Design Study Risk Analysis May be necessary to determine design alternative.

Signature – Dist. Hydraulic Engineer (Item numbers 3,4,5,7,9) Kathlyne Lare Date 9-5-11

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development?

NO X YES ____

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

Signature – Dist. Project Engineer (Item numbers 1,2,6,8) Date 9/5/11

LOCATION HYDRAULIC STUDY FORM

Dist. 12 Co. OC Rte. 405 P.M. 23.08
EA 071621 Bridge No. N/A
Floodplain Description: Bixby Storm Channel

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

Roadway widening, new bypass channel.

2. ADT: Current 370,000 Projected 512,000 (Alt. 3)

3. Hydraulic Data: Base Flood Q_{100}= 203 ft^3 / s
WSE_{100}= Unknown The flood of record, if greater than Q_{100}:
Q= Unknown ft^3 / s WSE= Unknown
Overtopping flood Q= Unknown m^3 / s WSE= Unknown
Are NFIP maps and studies available? YES X NO

4. Is the highway location alternative within a regulatory floodway ?
YES NO X

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q_{100} backwater damages:

A. Residences?	NO X	YES
B. Other Bldgs?	NO X	YES
C. Crops?	NO X	YES
D. Natural and beneficial floodplain values?	NO X	YES

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO	YES X
B. Emergency vehicle access?	NO	YES X
C. Practicable detour available?	NO X	YES
D. School bus or mail route?	NO X	YES

7. Estimated duration of traffic interruption for 100-year event hours: 8

8. Estimated value of Q_{100} flood damages (if any) – moderate risk level.

A.	Roadway	$ 0
B.	Property	$ 0
	Total	$ 0

9 Assessment of Level of Risk

Low X
Moderate ____
High ____

For High Risk projects, during design phase, additional Design Study Risk Analysis May be necessary to determine design alternative.

Signature – Dist. Hydraulic Engineer (Item numbers 3,4,5,7,9) Kathlyna Love Date 4-5-11

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development?

NO ____ X ____ YES ____

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

Signature – Dist. Project Engineer (Item numbers 1,2,6,8) Date 4/5/11

LOCATION HYDRAULIC STUDY FORM

Dist. 12 Co. OC Rte. 405 P.M. 23.53
EA 071621 Bridge No. N/A
Floodplain Description: Montecito Storm Channel

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

Roadway widening, soundwalls.

2. ADT: Current 370,000 Projected 512,000

3. Hydraulic Data: Base Flood Q_{100}= 410 ft^3 / s
WSE_{100}= Unknown The flood of record, if greater than Q_{100}:
Q= Unknown ft^3 / s WSE= Unknown
Overtopping flood Q= Unknown m^3 / s WSE= Unknown
Are NFIP maps and studies available? YES X NO

4. Is the highway location alternative within a regulatory floodway ?
YES NO X

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q_{100} backwater damages:

A. Residences?	NO X	YES
B. Other Bldgs?	NO X	YES
C. Crops?	NO X	YES
D. Natural and beneficial floodplain values?	NO X	YES

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO	YES X
B. Emergency vehicle access?	NO	YES X
C. Practicable detour available?	NO X	YES
D. School bus or mail route?	NO X	YES

7. Estimated duration of traffic interruption for 100-year event hours: 0

8. Estimated value of Q_{100} flood damages (if any) – moderate risk level.

A.	Roadway	$ 0
B.	Property	$ 0
	Total	$ 0

9 Assessment of Level of Risk

Low X
Moderate ____
High ____

For High Risk projects, during design phase, additional Design Study Risk Analysis May be necessary to determine design alternative.

Signature – Dist. Hydraulic Engineer (Item numbers 3,4,5,7,9) Kathlyne Lane Date 4-5-11

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development?

NO X YES

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

Signature – Dist. Project Engineer (Item numbers 1,2,6,8) _____ Date 4/5/11

APPENDIX E

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. 12 Co. OC Rte. 405 P.M. 9.89/11.45
Project No.: 71621 Bridge No.: N/A
Limits: Bristol St. in Costa Mesa to Interstate 605 in Long Beach

Floodplain Description: Gisler Storm Channel

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?		X
2.	Are the risks associated with the implementation of the proposed action significant?	X	
3.	Will the proposed action support probable incompatible floodplain development?	X	
4.	Are there any significant impacts on natural and beneficial floodplain values?	X	
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	X	
6.	Does the proposed action constitute a significant floodplain encroach-ment as defined in 23 CFR, Section 650.105(q).	X	
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.		X

PREPARED BY:

Kathlyne Lowe
Signature - Dist. Hydraulic Engineer

12-1-2010
Date

Signature - Dist. Environmental Branch Chief

12-2-2010
Date

Signature - Dist. Project Engineer

12/2/2010
Date

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. 12 Co. OC Rte. 405 P.M. 11.70
Project No.: 071621 Bridge No.: 55 0476
Limits: Bristol St. in Costa Mesa to Interstate 605 in Long Beach

Floodplain Description: Greenville Banning Channel

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?	X	
2.	Are the risks associated with the implementation of the proposed action significant?	X	
3.	Will the proposed action support probable incompatible floodplain development?	X	
4.	Are there any significant impacts on natural and beneficial floodplain values?	X	
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	X	
6.	Does the proposed action constitute a significant floodplain encroach-ment as defined in 23 CFR, Section 650.105(q).	X	
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.		X

PREPARED BY:

Kathlyne Lane
Signature - Dist. Hydraulic Engineer

12-1-10
Date

Signature - Dist. Environmental Branch Chief

12-2-2010
Date

Signature - Dist. Project Engineer

12/2/2010
Date

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. 12 Co. OC Rte. 405 P.M. 12.41
Project No.: 071621 Bridge No.: 55 0258
Limits: Bristol St. in Costa Mesa to Interstate 605 in Long Beach

Floodplain Description: Santa Ana River

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?		X
2.	Are the risks associated with the implementation of the proposed action significant?	X	
3.	Will the proposed action support probable incompatible floodplain development?	X	
4.	Are there any significant impacts on natural and beneficial floodplain values?	X	
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	X	
6.	Does the proposed action constitute a significant floodplain encroach-ment as defined in 23 CFR, Section 650.105(q).	X	
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.		X

PREPARED BY:

Kathlyne Lare
Signature - Dist. Hydraulic Engineer

12-1-10
Date

Signature - Dist. Environmental Branch Chief

12-2-2010
Date

Signature - Dist. Project Engineer

12/2/2010
Date

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. 12 Co. OC Rte. 405 P.M. 12.87
Project No.: 071621 Bridge No.: N/A
Limits: Bristol St. in Costa Mesa to Interstate 605 in Long Beach

Floodplain Description: Fountain Valley Channel

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?	X	
2.	Are the risks associated with the implementation of the proposed action significant?	X	
3.	Will the proposed action support probable incompatible floodplain development?	X	
4.	Are there any significant impacts on natural and beneficial floodplain values?	X	
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	X	
6.	Does the proposed action constitute a significant floodplain encroach-ment as defined in 23 CFR, Section 650.105(q).	X	
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.		X

PREPARED BY:

Kathlyne Lane
Signature - Dist. Hydraulic Engineer

12-1-10
Date

Signature - Dist. Environmental Branch Chief

12-2-2010
Date

Signature - Dist. Project Engineer

12/2/2010
Date

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. 12 Co. OC Rte. 405 P.M. 14.50/16.98
Project No.: 071621 Bridge No.: 55 0478
Limits: Bristol St. in Costa Mesa to Interstate 605 in Long Beach

Floodplain Description: Ocean View Channel

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?	X	
2.	Are the risks associated with the implementation of the proposed action significant?	X	
3.	Will the proposed action support probable incompatible floodplain development?	X	
4.	Are there any significant impacts on natural and beneficial floodplain values?	X	
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	X	
6.	Does the proposed action constitute a significant floodplain encroach-ment as defined in 23 CFR, Section 650.105(q).	X	
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.		X

PREPARED BY:

Kathlyne Laure
Signature - Dist. Hydraulic Engineer

12-1-10
Date

Signature - Dist. Environmental Branch Chief

12-2-2010
Date

Signature - Dist. Project Engineer

12/2/2010
Date

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. 12 Co. OC Rte. 405 P.M. 14.50/16.98
Project No.: 071621 Bridge No.: 55 0480
Limits: Bristol St. in Costa Mesa to Interstate 605 in Long Beach

Floodplain Description: East Garden Grove Wintersburg Channel

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?	X	
2.	Are the risks associated with the implementation of the proposed action significant?	X	
3.	Will the proposed action support probable incompatible floodplain development?	X	
4.	Are there any significant impacts on natural and beneficial floodplain values?	X	
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	X	
6.	Does the proposed action constitute a significant floodplain encroach-ment as defined in 23 CFR, Section 650.105(q).	X	
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.		X

PREPARED BY:

Kathlynne Lane — 12-1-10
Signature - Dist. Hydraulic Engineer — Date

Lori Rhyne — 12-2-2010
Signature - Dist. Environmental Branch Chief — Date

[signature] — 12/2/2010
Signature - Dist. Project Engineer — Date

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. 12 Co. OC Rte. 405 P.M. 20.56/20.91
Project No.: 071621 Bridge No.: N/A
Limits: Bristol St. in Costa Mesa to Interstate 605 in Long Beach

Floodplain Description: Milan Storm Drain

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?	X	
2.	Are the risks associated with the implementation of the proposed action significant?	X	
3.	Will the proposed action support probable incompatible floodplain development?	X	
4.	Are there any significant impacts on natural and beneficial floodplain values?	X	
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	X	
6.	Does the proposed action constitute a significant floodplain encroach-ment as defined in 23 CFR, Section 650.105(q).	X	
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.		X

PREPARED BY:

Kathlynne Lane
Signature - Dist. Hydraulic Engineer

12-1-10
Date

Signature - Dist. Environmental Branch Chief

12-2-2010
Date

Signature - Dist. Project Engineer

12/2/2010
Date

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. 12 Co. OC Rte. 405 P.M. 23.08
Project No.: 071621 Bridge No.: N/A
Limits: Bristol St. in Costa Mesa to Interstate 605 in Long Beach

Floodplain Description: Bixby Storm Channel

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?		X
2.	Are the risks associated with the implementation of the proposed action significant?	X	
3.	Will the proposed action support probable incompatible floodplain development?	X	
4.	Are there any significant impacts on natural and beneficial floodplain values?	X	
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	X	
6.	Does the proposed action constitute a significant floodplain encroach-ment as defined in 23 CFR, Section 650.105(q).	X	
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.		X

PREPARED BY:

Kathlyne Lane
Signature - Dist. Hydraulic Engineer

12-1-10
Date

Signature - Dist. Environmental Branch Chief

12-2-2010
Date

Signature - Dist. Project Engineer

12/2/2010
Date

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. 12 Co. OC Rte. 405 P.M. 23.53
Project No.: 071621 Bridge No.: N/A
Limits:

Floodplain Description: Montecito Storm Channel

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?	X	
2.	Are the risks associated with the implementation of the proposed action significant?	X	
3.	Will the proposed action support probable incompatible floodplain development?	X	
4.	Are there any significant impacts on natural and beneficial floodplain values?	X	
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	X	
6.	Does the proposed action constitute a significant floodplain encroach-ment as defined in 23 CFR, Section 650.105(q).	X	
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.		X

PREPARED BY:

Kathlyne Lane
Signature - Dist. Hydraulic Engineer

12-1-10
Date

Signature - Dist. Environmental Branch Chief

12-2-2010
Date

Signature - Dist. Project Engineer

12/1/2012
Date